SCIENTIFIC AMERICAN

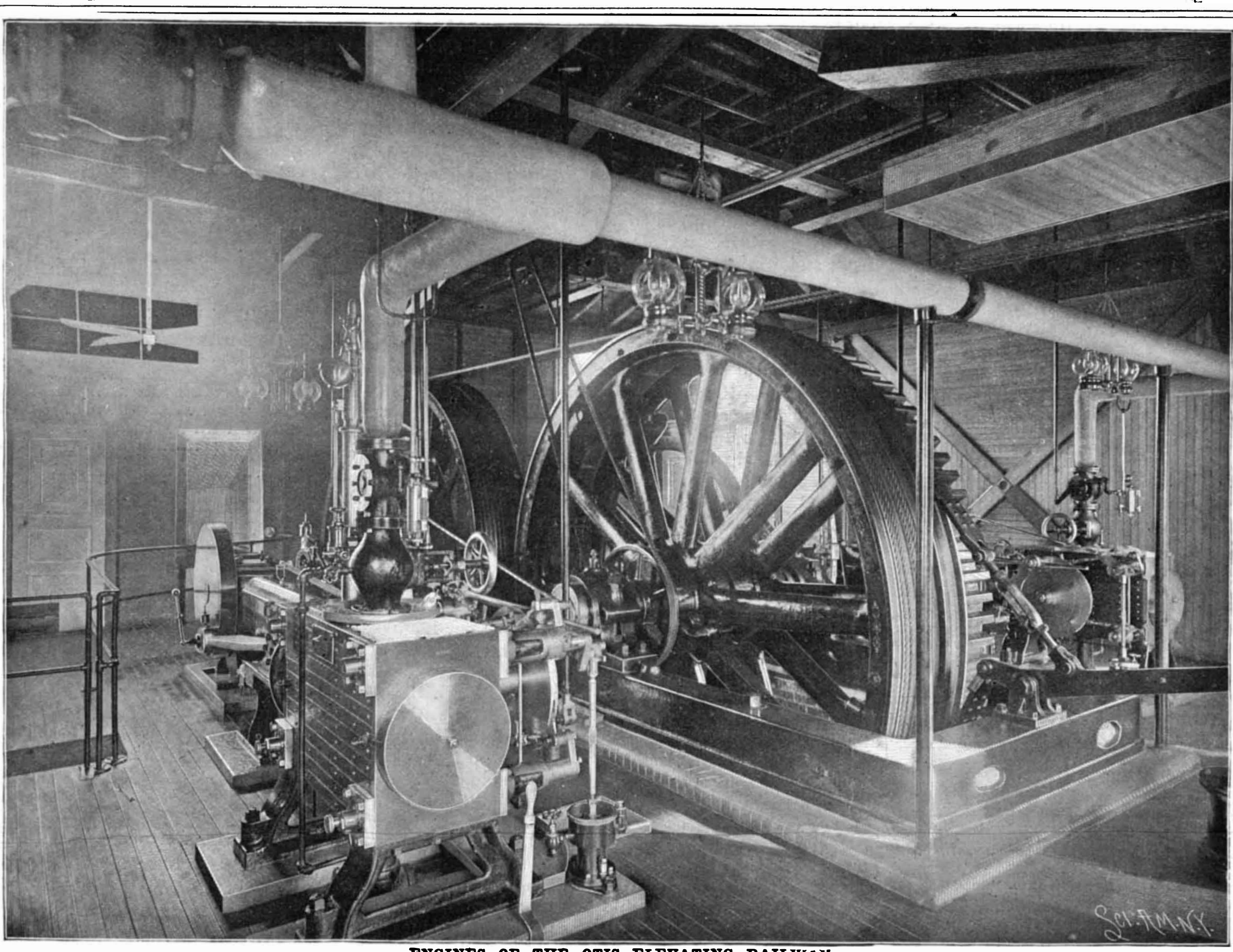
[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

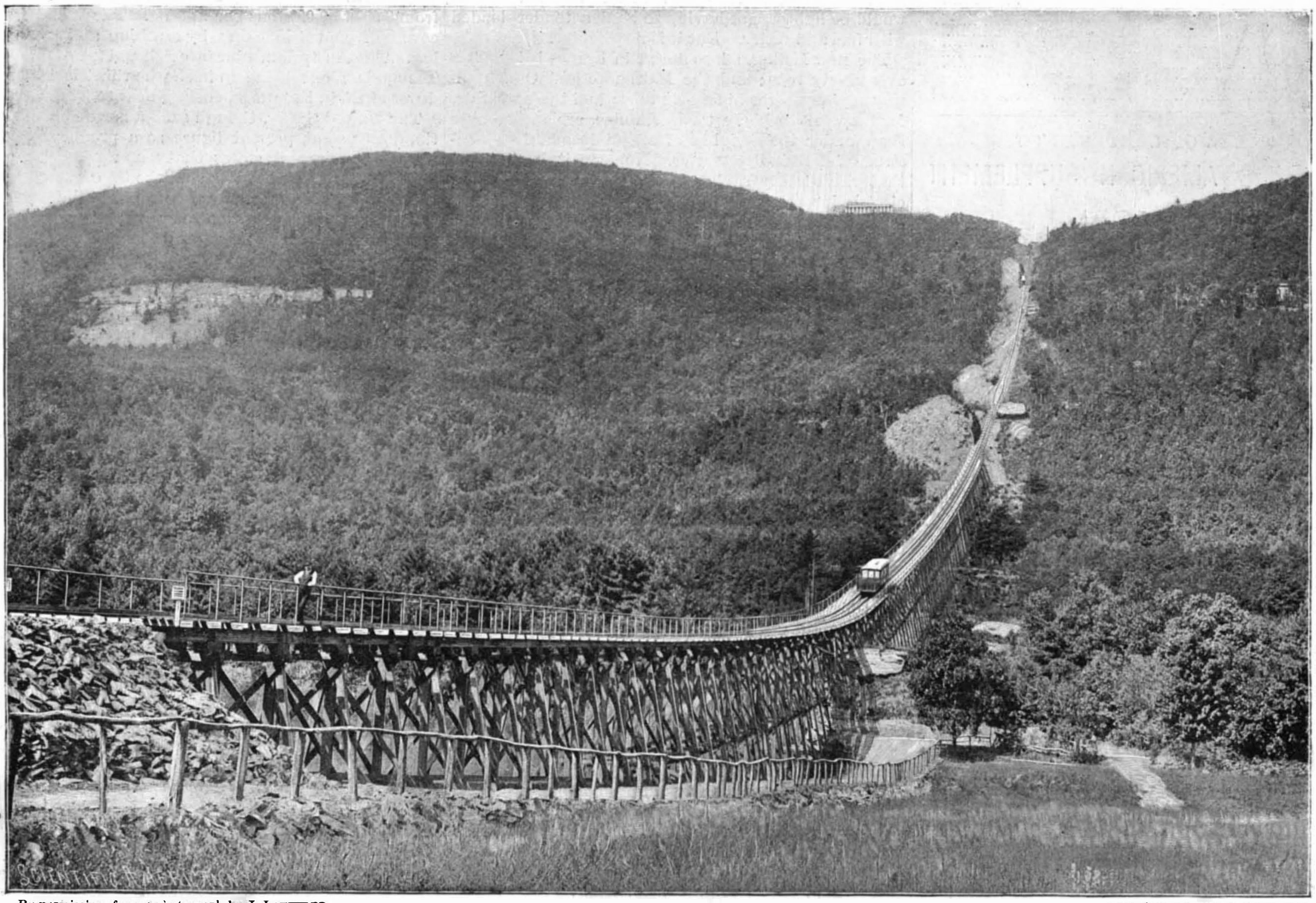
Vol. LXXIII.—No. 14.
ESTABLISHED 1845.

NEW YORK, OCTOBER 5, 1895

$3.00 A YEAR.
WEEKLY.



ENGINES OF THE OTIS ELEVATING RAILWAY.



By permission, from a photograph by J. LOEFFLER.

Copyright, 1892, by J. LOEFFLER.

THE OTIS ELEVATING RAILWAY, CATSKILL MOUNTAINS, N. Y.—[See page 215.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.................$3 00
One copy, six months, for the U. S., Canada or Mexico................ 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year*.

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, OCTOBER 5, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1031.

For the Week Ending October 5, 1895.

Price 10 cents. For sale by all newsdealers.

THE LOCOMOTIVE OF THE FUTURE.

Is the electric locomotive to supersede the steam locomotive, as the future tractive power on our railroads? It is popularly supposed that it will, and striking developments are being looked for by the public in the trials that are now being made, both in France and America, with electric locomotives of the same weight and power as the standard up-to-date steam locomotive. From the day that electricity was first used as a tractive force, it has been the fashion to predict the early decline of the steam locomotive, and the substitution of some form of electrical traction in its place. It was confidently predicted that motors of half the bulk and weight of the modern engine would soon be hauling our trains at unprecedented speeds, and with that noiseless energy and cleanly operation that distinguishes electric power.

This swifter and more silent transportation was to be accomplished with less expense than the present method by steam locomotives.

It is now some years since these sweeping prophecies were first made and in the interval electric traction has had an extended trial on trolley and suburban lines. It is to-day being tested on standard gage trunk lines; and it is safe to say that, as the case now stands, there are no indications that the future existence of the steam locomotive is in any way jeopardized.

In judging of the relative efficiency of the steam and electric locomotives there is one ultimate test by which they will be tried and upon which the verdict will be given—the test of economy. Other things being equal, the engine which can haul a given trainload a given number of miles on the smallest consumption of fuel will be the engine of the future.

There is no sentiment in a question such as this. It is judged entirely from the shareholders' point of view. However much we might like to see our lightning expresses sweeping from city to city impelled by the silent force, it is certain we shall never see that sight until the day comes when electric traction can be produced at a consumption of fuel considerably less than the three pounds of coal per horse power per hour that marks the performance of the best locomotive practice of to-day.

As the case now stands, the economy lies with the steam locomotive, for the reason that the power generated in the boiler is transferred as tractive force directly to the rails, and it is subject merely to the loss occasioned by the internal friction of the engine itself.

In the case of the electric locomotive, in addition to this loss by internal friction in the engine at the power house, there is a loss between the engine and the dynamo; there is a loss in the resistance of the wire that transmits the current, and there is another loss in the motor itself. Now this treble loss of power must in some way be compensated for before the two engines stand even on equal terms. What compensation can the electric locomotive offer? It was claimed that it would be lighter, not having to haul a tender loaded with fuel and water. But it is not lighter.

The new Heilmann locomotive in France is to weigh over ninety tons; and the Baltimore and Ohio Railway engine weighs ninety-six tons; and these weights, for the work they are to accomplish, are rather over than under the weights of steam locomotives constructed for similar service. Nor can it be claimed that there is any saving in first cost. A ninety ton electric locomotive cannot at present be built for very much less than a steam locomotive of equal power; and what margin there might be in its favor is largely offset by the cost of the expensive installation of boilers, engines and dynamos, that must be erected at stated intervals along the line; and by the cost of the wiring for transmission of the current.

There remains then the question of maintenance and running expenses. In this respect, for the first time in this comparison, we can see a distinct advantage for the electric locomotive; inasmuch as the purely rotary motion of its moving parts is far less conducive to wear and tear than the combined reciprocating and rotary motion of the moving parts of the steam locomotive. As an offset against this, however, there must be placed the deterioration of the system of wiring, and the wear and tear of the engines and boilers at the power house. It is fair to suppose that the wear and tear at the power house—a part of which is justly chargeable to each of the locomotives that it serves—will fully offset any advantage that the electric may have over the steam locomotive in this respect.

At present there are no statistics available by which a comparison of the cost of labor in the two systems can be made. It is probable, however, that the engineer of a first-class electric locomotive would require the services of an assistant, in which case the expense of the power house staff would have to be reckoned against the electric system in a comparison.

There remains then the question of fuel economy. Unless the electric system can show a very marked economy in this respect, it is evident from the foregoing considerations that a strong case is made out in favor of the present system of steam haulage. The best steam locomotive practice of to-day shows that a modern express locomotive will produce one horse power per hour on the consumption of three pounds of coal. It is doubtful if the best electric light installations can show a better result.

Unless a system of stationary boilers and engines can be produced that will furnish the electric locomotive with its power for one-half the coal consumption that is necessary for the generation of the same power in the steam locomotive, we may rest assured that George Stephenson's invention will remain among us for years to come as the greatest triumph of the modern mechanical world.

THE WORLD'S PRODUCTION OF TIN.

We have before us an extract from the sixteenth Annual Report of Mr. Charles D. Walcott, Director of the United States Geological Survey, for the year 1894-95. It consists of a printed report on the production of tin in the various parts of the world by Mr. Charles M. Rolker.

In the past ten years the total output has risen from 50,299 tons in 1884 to 83,387 tons in 1894. The subjoined table shows that more than one-half of the world's output for 1894 came from the Straits Settlements in the Malay Peninsula.

WORLD'S OUTPUT OF TIN, 1894.

1.	The Straits to Europe and America	46,724
2.	England	8,800
3.	Australia to Europe and America	5,824
4.	Banca sales to Holland	6,139
5.	Billiton sales to Holland and Java	4,764
6.	Bolivian imports into England	3,482
7.	Straits to India and China	4,655
8.	Sundry countries	642
9.	Germany	896
10.	Austria	65
	Total	83,387

The Straits tin mines are the most prolific, and they are probably the oldest, in the world. Before the Christian era the Ethiopians, and later the Arabians, traded with India and "used the Indian name 'Naak' to designate tin, a fact which would point to farther India as the source of the tin industry in those days."

There was a Roman coin in use in the year 500 B.C. which contained 7·66 per cent of tin; and this antiquity of the use of tin is shown by a coin of Alexander the Great, 335 B.C., which contains 13·14 per cent of tin. Historical records for the past two thousand years speak from time to time of the tin that is brought from the Malay Peninsula. The present tin mines of this district are alluvial. The constituent parts of the alluvium vary, as does the depth; but the characteristic covering that has to be removed is of an average depth of ten to eleven feet, and consists chiefly of clay seams, alternating with sand and gravel. The pay gravel has an average depth of eight feet. The process of recovery is by washing in boxes; and Chinese labor is largely employed.

The well known tin mines of Cornwall, England, vary very little in their yearly output; the amount running from 8,000 to 9,000 tons per annum. The metal is recovered from the lode ores by crushing and by smelting. The Australian mines are rich and full of promise, Tasmania alone being in itself the third largest producer of tin in the world, coming next to Cornwall.

The United States, though such a large consumer of tin, does not at present figure as a producer of the metal. The report states that "no tin is being produced in the United States, and the tin occurrences of this country are so far only of geological or mineralogical interest, with indications of prospective value in a few instances." The most promising indications are those found in the Black Hills of Dakota.

Hardening Steel by Gas.

Consul Monaghan, of Chemnitz, reports (June 16) that the Germans are interested in a new process for hardening steel by means of gas. The invention originated with the famous French steel and iron firm Schneider & Company, of Creusot.

It is a well known fact that gas, under great heat, deposits carbon in solid form. Upon this depends its light effects, and also the formation of the so-called retort graphites, a thick covering of pure carbon on the walls of the gaslight retort. The gas that strikes the retort walls deposits part of its carbon upon them. This is the fact on which Schneider bases his very useful invention—a process for cementing together (uniting) steel armor plates.

It is said to be very important in the production of armor plates to have them comparatively soft inside and hard outside. This hardening is obtainable by the application of carbon. Formerly, the process of hardening consisted in covering the plates with layers of coal and heating them till they glowed. Schneider's process puts two plates into a furnace, one on top of the other, with a hollow space between. This space is made gas tight by means of asbestos packing put on around the edges, and the plates are heated red hot, while a stream of light gas is poured into the hollow space indicated. The carbon thrown out by the gas is greedily taken up by the glowing plates until they are thickly covered. The depth of this carbon covering can be regulated by the amount of gas admitted. In order to secure regular and uniform act-

ion during the process, and to prevent the pipes that carry the gas to the hollow space from absorbing any of the carbon, they are insulated in other pipes through which water is constantly circulating. It is believed that this simple and rapid carbonizing process will soon be applicable to many other branches of the steel industry.

William O. Grover.

The death of William O. Grover removes from our midst the last of the original inventors and promoters of sewing machines. A man of ingenious mind, genial disposition, kind hearted, liberal, he will be greatly missed by all who knew him.

He died at his summer residence, in Beverly, Mass., September 5, aged 71.

When the business of the Grover & Baker Sewing Machine Company was sold to the Domestic Sewing Machine Company, in 1876, Mr. Grover retired from commercial activity, and has since lived in Boston, enjoying his large fortune realized from the sewing machine business.

He was a native of Mansfield, Mass., his family being among the oldest of the State.

The Sewing Machine Times says: "William O. Grover and William E. Baker were the original inventors and patentees of the sewing machine that bore their name and for some years was among the foremost in the market. These patents were issued in 1851–52 and the machine placed on the market about 1853. It was built in Boston, where the inventors lived. Mr. Grover was a tailor before turning his attention to the sewing machine.

"The gist of the joint invention of Messrs. Grover & Baker was in making the double loop stitch, which was new, by the circular under-needle and in the so-called 'four-motion' feed. These were two of the most important, in a commercial sense, of all known to the trade, the stitch-forming mechanism being the foundation of the Grover & Baker business, and the feed becoming a necessary element for all successful sewing machines for general purposes, even to this day. After these joint inventions Mr. Grover made many others in the development of the early machines, and from 1856 to 1879 took out seventeen such additional patents. He was not known as an inventor in other lines.

"The four-motion feed patent was one of the most important of those by which the old combination controlled the market, and was the one on which they usually brought suit against infringers. It was reissued to broaden its claims and was extended for seven years, expiring in 1873, after which time the Bachelder patent was the bulwark of the combination.

"An interesting fact revealed by the Patent Office records is the simultaneous invention of the four-motion feed by Grover & Baker and by Allen B. Wilson, of Wheeler & Wilson. Both had applications before the office claiming the four-motion feed, as we have always known and used it. It had never been used commercially. Wilson had, in the previous year, 1851, patented the yielding-pressure feeder, but with only two motions. While the four-motion invention was clearly subsidiary to Wilson's patent, the latter needed the four-motion improvement to make it successful. Of course the struggle was a hard one to obtain control of so valuable a feature. The result of the investigation was in favor of Grover & Baker, who had been able to show that their invention was in patentable shape a few days earlier than Wilson's, and the two patents issued in June, 1852, showed and described the disputed invention, but only one of them claimed it."

The Gum Benjamin Industry in Siam.*

The Gum Benjamin tree is large and tall, and has a heart similar to that of the "teng-rang" (a species of Shorea) and "phayom" (a kind of mahogany). In its general character and in the form of its leaves it resembles the "takieu" tree (a forest tree of hard wood used for making dug-out boats). The Gum Benjamin tree is propagated from the original fruit. This, when fallen and lying upon the ground, takes root and sprouts after the fashion of the "phayom" and "gang" trees. As regards the trunk of the Gum Benjamin tree, there is no one who uses it. Gum Benjamin trees are generally found on elevated ground, and do not like the plains country. They grow in isolated patches like the forests of "teng-rang" and teak. A forest patch of Gum Benjamin usually contains from 50 to 60 trees and upward, and the tree is found generally in large numbers along the high hills in the extensive forest region of Slua Phan, Tangslok and the borders of Muang Theng, in the province of Luang Prabang. It is rarely met with in other countries, except those outside the provinces immediately contiguous to Siam. The Siamese Thai, Annamites and Tongsoos, who have settled in the above-mentioned provinces, have worked out and traded in the Gum Benjamin from an early period for successive generations, and these are scattered among the neighboring people, as well as being frequently found in Siam also. The season for working the Gum Benjamin is from the eighth or ninth months (July and August) to the tenth and twelfth months (September and November), when the season ends.

Thenceforward is the period during which the Gum Benjamin is bought and sold. The Gum Benjamin is worked after the following methods. So many trees are notched so as to form a girdle round the stem. An interval of three months is allowed to elapse between the period of notching and that of picking the Gum Benjamin dammar, which wells out of the trunk and collects in the notches. By means of a sharpened stick or the point of a knife this is picked out, bark and all, and gathered at once in baskets. It is then sorted and divided into different classes, according to choice. Picking cannot commence before the interval of three months has elapsed, as the dammar that has trickled out into the notches would not have had time to harden. It would still be soft and sticky, and if picked at the time would become dirty, owing to the bark coming off with it; nor would it be of such value either, as, being sticky, it would cling to other things, and the full benefit would not be derived, such as would be the case if it were properly dry. For this reason, the Gum Benjamin must be left for three months after the notching, in order that all the gum possible may well out, and it may become dry and hard.

Among the people above mentioned the picking and sale of Gum Benjamin is generally considered as one way of obtaining a livelihood, for the gum has a value, and is reckoned as a marketable commodity. And even if the people have no other occupation but selling Gum Benjamin, that by itself is sufficient as a means of livelihood. The period during which the Gum Benjamin is sold is not necessarily confined to the eighth or ninth months. The reason for selecting that season is because the people of those parts have many other things to do; for instance, they have to plow the fields and reap their rice harvest. In the eighth and ninth months their work on the paddy fields is finished, and they can therefore turn their attention to Gum Benjamin. For this reason there is a special season. Their paddy fields are their first care, and then the Gum Benjamin trade. Those who have no business with plowing paddy fields and planting rice can, if they wish, work continuously at Gum Benjamin at all seasons, and during every month of the year.

The Gum Benjamin trade requires no very great outlay of capital. All the implements required are one large ax, a rice basket, and an open woven basket. If a person wishes to work alone without servants to assist him, he can do so; for in the first stages there is nothing much that requires to be lifted or carried. The only labor necessary would be when the Gum Benjamin is being picked and placed in baskets, and has to be carried to the temporary or permanent home of picker. The profits gained on any one particular occasion or another can hardly be gaged accurately. Those who work out much sell at a large profit, those who work out little sell at smaller profit. One catty (133⅓ pounds) and upward would be considered a large output.

Picked Gum Benjamin is sorted into three classes. The best class, and that which fetches a high price, is called "slua," and is that which is sold in large lumps, and is not dirtied by the presence of bark. The second class is that left over from the first class, and is in somewhat smaller lumps than the latter, and has some, but not much, bark attached to it. This is inferior in quality to Class I, and is half the value. That is to say if Class I is sold at 75 ticals, Class II would sell at 37½ ticals. The third class is that left over from Class II. This class has bark attached to it, is soiled with dust and dirt, and is in fine, small pieces. It is called "mun," and is half the value of Class II. The price of Gum Benjamin as sold in the jungle districts where the gum is worked is as follows: Class I. One Chinese catty (66⅔ pounds), 100 or about 75 ticals. Class II. Half the price of Class I. Class III. Half the price of Class II. The price in Bangkok is: Class I. One Chinese catty, 260 ticals, as it has always been.

The Gum Benjamin trees that grow in the jungle districts referred to are not the subject of disputed ownership by one person more than another. Any one who wishes to work Gum Benjamin has merely to go into the jungle, search for and notch as many trees as he pleases, like people, for example, who go into the jungle to cut posts for their houses. Nor is there any tax or other emolument accruing to the country from either the trunk or the gum of the Gum Benjamin tree; nor is the Gum Benjamin trade one in the prosecution of which much thieving or fighting arises, whether it is because there are many people together at a time, or because, being in the jungle where there are fierce tigers, one man cannot steal along alone by himself, but is obliged to travel with parties, and so robbery and theft are rendered impossible, is uncertain. This gum is sweet scented, and is much used in mixing either with medicines or scents of various kinds. For whichever of these purposes it is sold, it always fetches a high price like other valuable commodities, and for that reason Gum Benjamin is an article of commerce which merchants have bought and sold from time immemorial to the present day.

* From the Kew Bulletin.

The Reagan Water Circulating and Shaking Grate.

Any one who has had to do with the care of boilers knows that clinkers in the grate and scale in the boilers are two of the worst obstacles to rapid and continuous steam raising. The Reagan water-tube grate is a well-tested and very successful device for meeting this difficulty.

The grate consists essentially of a series of longitudinal two-inch water pipes, between and alternating with which are a series of oscillating rockers or "choppers." These "choppers" are arranged on bars which run transversely to the water pipes and beneath them; the surface of the "choppers" being level with the axis of the pipes.

The water pipes are fitted at their ends into water boxes; each box taking two pipes, and each box being separate from its neighbor. This arrangement allows the system to expand and contract with the variations of temperature.

The "choppers" keep the bottom of the fire clean, and continuously loosen up and carry away the ash and dirt, which, in the ordinary grate, accumulate and necessitate the opening and keeping open of the fire doors during the operation of cleaning. The continuous inrush of cold air during a cleaning cools off the boiler, and rapidly reduces the steam pressure. The water tubes serve a three-fold purpose:

1. They heat the feed water.

2. In doing so they protect the grate by taking up heat that would otherwise destroy the bars.

3. By the system of circulation through these tubes the boiler is kept clean and free from scale. The makers claim that in cases where these tubes have been in use many years, and using very bad water, they have never been troubled with a tube choking up with sediment or scale.

A series of tests of this grate were made last May by the firm of John Brown & Company, of Sheffield, England. In competition with an ordinary grate this showed an evaporation of no less than 43 per cent more water; and it also showed 14·23 per cent more economy. This was certainly a very creditable result.

The results in the testing laboratory are borne out in actual working tests. The Bridgeport Traction Company state that their monthly coal bill has been reduced by the use of this grate from $1,547 to $919.65, a saving of $627.35. The grate is manufactured by the Water Circulating Grate Company, 126 to 128 Filbert Street, Philadelphia, Pa.

Another Sea Serpent.

A great sea serpent was seen off the Jersey coast at Spring Lake, on Sunday afternoon, September 22, at 1:40 P. M. The testimony concerning the monster is well corroborated. It was seen by Lawyer Willard P. Shaw, a resident of Paterson, N. J., with offices in New York City. With him at the time was his wife, three children, and Miss Ella B. D. Salter, of Paterson. The serpent was also seen by Mr. Philip N. Jackson, another cottager at Spring Lake, who is secretary of the Newark Electric Light Company.

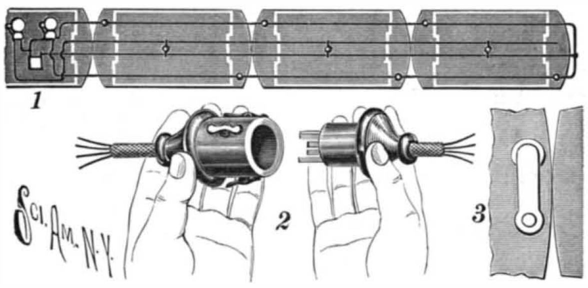
An excellent view was had through binoculars while it was passing directly opposite at a distance of not more than half a mile. The head was of a peculiar shape, quite unlike that of any creature Mr. Shaw had ever seen, and was as large around as a flour barrel, but longer. The nose and mouth resembled those of an alligator. There were no tentacles to be seen. The body was smooth and round, of dark color, and apparently destitute of fins. The monster was making its way to the south and skirting along the shore. Its movements seemed to be effected by a vertical undulation of the body. In the course of its progress it would throw itself out at full length on the surface and then sink its body beneath the water, while the head would be uplifted several feet above the waves. Many ships and schooners frequently pass on the ocean where the serpent was seen. From a knowledge of the size and speed of these, Mr. Shaw makes a conservative estimate of its length at 100 feet, and says that its speed certainly exceeded that of any vessel, and was in the neighborhood of 40 or 50 miles an hour. The serpent was followed with the glasses for six or seven minutes, when it disappeared in the distance to the south. The head was the last part that remained visible.

Owing to the lateness of the season, all the hotels along the coast are closed, and, as the afternoon was hot and sultry, few of the remaining cottagers were stirring. For these reasons, and owing to the short time that the monster remained in sight, there was no opportunity to call other witnesses.

A GOOD engine in charge of a good man rarely requires to be stopped in working hours. When one is stopped frequently, adds the Safety Valve, it would be a good plan to find out whether it is the engine that is out of order, or the man in charge of it.

ELECTRIC TRAIN "STOPPING" AND "STARTING" SIGNAL.

The illustration represents a very simple system of signaling to the engineer from any part of a train, each conductor contributing his part to the closing of the circuit, and the signal being given the moment the last conductor completes the closing of the entire circuit. The improvement is represented as arranged especially for use on elevated railway trains, insuring promptness in leaving stations. A patent has been granted for this invention to Francis C. E. von Sternberg, of No. 933 Lafayette Avenue, Brooklyn, N. Y. In Fig. 1 are indicated three cars of a train and the

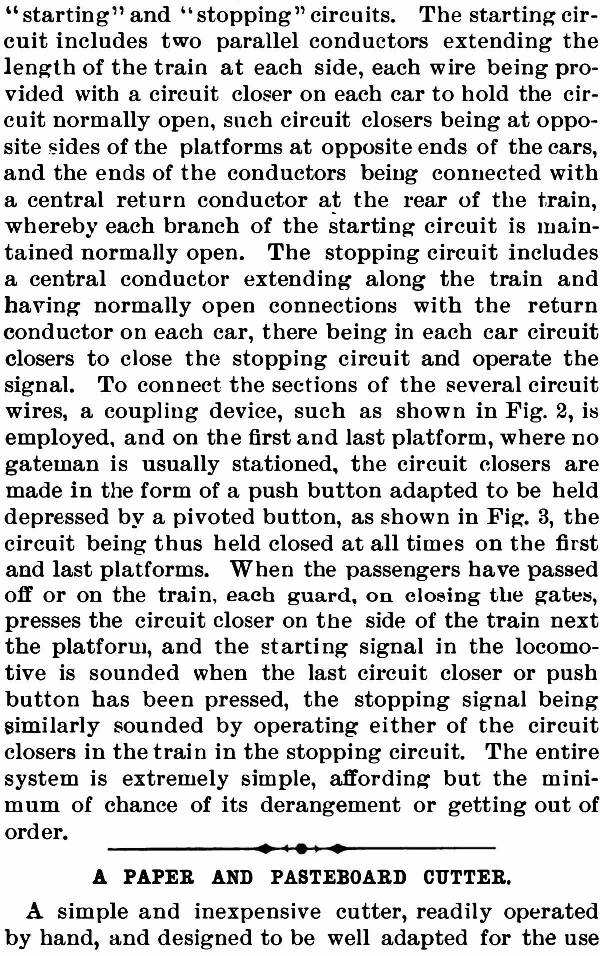


VON STERNBERG'S ELECTRIC TRAIN SIGNAL.

engine, there being in the cab two electric bells and a battery, connected up with the train wires to form "starting" and "stopping" circuits. The starting circuit includes two parallel conductors extending the length of the train at each side, each wire being provided with a circuit closer on each car to hold the circuit normally open, such circuit closers being at opposite sides of the platforms at opposite ends of the cars, and the ends of the conductors being connected with a central return conductor at the rear of the train, whereby each branch of the starting circuit is maintained normally open. The stopping circuit includes a central conductor extending along the train and having normally open connections with the return conductor on each car, there being in each car circuit closers to close the stopping circuit and operate the signal. To connect the sections of the several circuit wires, a coupling device, such as shown in Fig. 2, is employed, and on the first and last platform, where no gateman is usually stationed, the circuit closers are made in the form of a push button adapted to be held depressed by a pivoted button, as shown in Fig. 3, the circuit being thus held closed at all times on the first and last platforms. When the passengers have passed off or on the train, each guard, on closing the gates, presses the circuit closer on the side of the train next the platform, and the starting signal in the locomotive is sounded when the last circuit closer or push button has been pressed, the stopping signal being similarly sounded by operating either of the circuit closers in the train in the stopping circuit. The entire system is extremely simple, affording but the minimum of chance of its derangement or getting out of order.

A PAPER AND PASTEBOARD CUTTER.

A simple and inexpensive cutter, readily operated by hand, and designed to be well adapted for the use



BYRD'S PAPER AND PASTEBOARD CUTTER.

of country printers, is shown in the accompanying illustration, and has been patented by Charles A. Byrd, of Drain, Oregon. Fig. 1 is a side view of the machine, with the parts adjusted to receive the paper to be cut, Fig. 2 being a partly sectional view of the opposite side of the cutter, showing the paper-clamping device. The presser arm and block are engaged and operated by a lever having a cam-shaped end to firmly clamp any thickness of material, from a single sheet to the greatest thickness within the range of the device; and when the stock has been clamped the movement of the knife lever effects a drawing cut by the blade. As the main portions of the machine may be made of cast metal at a low cost, a cutter of this description can be afforded at a very moderate price.

The Carl Zeiss Optical Works.

The Carl Zeiss Optical Works at Jena are probably the most important of their kind in the world and are quite exceptional in their constitution. The firm was established some years ago by a skilled workman whose name it bears. He is no longer living, neither is any member of his family connected with the factory. Jena is a university city in Saxe-Weimar-Eisenach, one of the Thuringian states of the German Empire. When Zeiss began to make his way he found the necessity of the association of some scientific adviser, and was fortunate enough to obtain in that capacity the well known Professor Abbe. In consequence of the rule that only the very best possible work should leave the factory, the business grew with great rapidity.

This institution is now a public trust, with the Duke of Saxe-Weimar as chairman. By public trust it must not be supposed that a public company in the ordinary sense is meant, for the profits annually earned, which are large, do not benefit individuals in the sense of shareholders. The payment of wages to the ordinary staff is liberal, the scientific staff receiving no less a sum than $25,000 annually. In this division is still included Professor Abbe, with whom is associated Dr. Czapski, as advisers in the optical department, and Dr. Pulfrich in a like capacity on instruments for physical research, while Dr. Rudolph advises on photographic objectives; Mr. Fischer being general business manager. To return to the question of the profits, they are divided between old age pensions for the workmen and grants for the encouragement of scientific research. The University of Jena receives a portion of these latter grants and more than one Englishman has participated, if not actually in money, in the form of scientific instruments. The invested pension fund now exceeds $1,250,000.

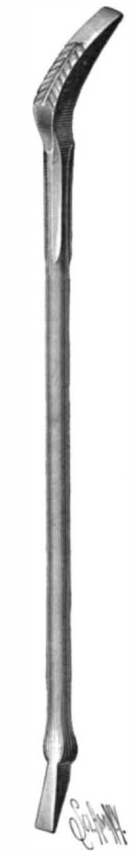
Some idea of the magnitude of the Carl Zeiss Works may be gathered from the fact that it requires three hours to pass through the various wings and departments, without leaving much leisure for inspection of details. Upward of 500 workpeople are employed, a curious feature being that there is no difficulty in obtaining skilled workers in metals, but the optical hands have to be trained within the works from boyhood. In consequence of the frequent addition of extra rooms to the factory difficulty in transmitting the power from a central steam engine was from time to time increasing, the loss of power being more than forty per cent. This difficulty has been overcome by making the steam engines drive large electric dynamos, which are connected to separate motors under each workman's bench. The loss has thus been reduced to eighteen per cent.—Science Gossip.

The Electrical Production of Carbon.

It has been recently shown, says the London Electrician, that at the highest temperature attainable in an electric furnace, all substances other than carbon are dissipated and removed, with the result that the ends of the electrodes are not only graphitic, but are also sensibly pure. It follows that a carbon plate or rod, of dense graphitic structure, good conductivity, and unusual freedom from impurity, should be producible by exposing the ordinary moulded article to the temperature of the electric furnace. This is precisely the direction in which Messrs. Street and Girard have been working. They claim to have succeeded in producing a form of carbon the conductivity of which is fourfold that of the untreated material, while its resistance to chemical action is also much enhanced. Taking the density of an ordinary carbon before heating as 1·98, they find that after treatment it has attained a density of 2·6. Should this figure be corroborated, it must be considered remarkable, inasmuch as the density of graphite obtained by ordinary means is not higher than 2·3, while the same figure has been observed as a maximum for hard gas carbon. Analysis of the carbons thus made indicated that the percentage of carbon transformed into graphite was about 80 to 85 per cent. The method of analysis is, however, by no means beyond criticism, depending, as it does, on the conversion of the graphite into the highly indefinite body known on the lucus a non lucendo principle as graphitic acid, which in no way resembles graphite, or comports itself as an acid. This point, however, may safely be left for future settlement. The precise percentage of graphite is not of moment, provided a product has been obtained possessing many of the properties that would be exhibited by a sound coherent block of that form of carbon. When once criticism is allayed by the appearance, in a marketable form, of carbon which is nearly free from other elements than C and neither oxidizes easily nor irregularly, nor breaks up when used as an anode for aqueous or igneous electrolysis, an ample field of application will at once be open. To take one of the most pressing cases alone; it is notorious that next to the want of a good diaphragm, the most urgent need of those interested in commercial electrolysis has been a reliable, unattackable anode.

GATTI'S PRYING BAR FOR HANDLING LUMBER.

The illustration represents a tool more especially designed for the use of stevedores in loading vessels with lumber. It has been patented by Tony C. Gatti, of Scranton, Miss. It consists of a bar of steel having at one end a curved point and serrated back, to give a good hold on the lumber and prevent slipping, while at the other end is a stop in the form of a chisel point terminating in a collar, preventing the stop from passing too far into the lumber. The stop is employed to stop the timber passing through the port into the vessel, by placing the opposite point of the tool against one log and engaging with the stop the incoming log, the collar preventing the stop from entering the timber more than about two and a half inches, instead of five or six inches, as is frequently the case with stops without a collar.



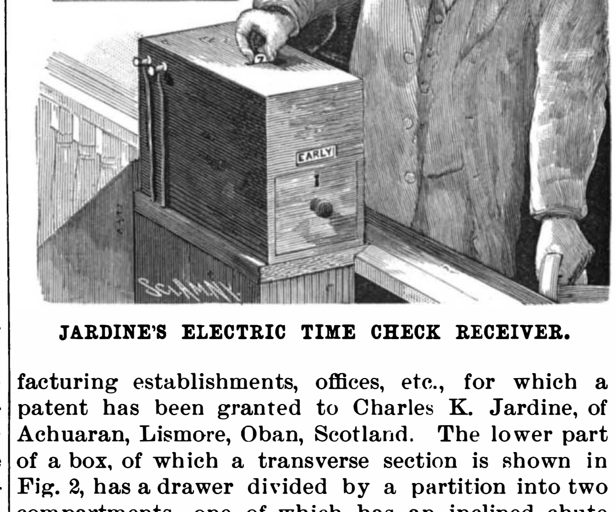
Man's Susceptibility to Weather.

Who has not felt the difference between a depressing and an exhilarating day? Sydney Smith wrote: "Very high and very low temperature establish all human sympathy and relations. It is impossible to feel affection above 78 degrees or below 20 degrees." Dr. Farr and Dr. Stark almost lead us to think morality is registered on the thermometer, so surely does it measure certain kinds of criminality. On suicides the effects of the weather are well known. Nearly all vocations are affected by weather. Men of science are often as much subject to weather as seamen. Some writers must have the weather fit the mood, character or scene. If one will read poetry attentively, he will be surprised to find how many weather marks are scattered through it. Diverse weather states may be one cause of so much diversity and even disagreement in thought processes usually regarded as scientific. Many experienced teachers think there should be modifications of school work and discipline to correspond with the weather.

The head of a factory employing three thousand workmen has said: "We reckon that a disagreeable day yields about ten per cent less work than a delightful day, and we thus have to count this as a factor in our profit and loss account." These are some of the ideas put forth in a preliminary statement by J. S. Lemon, who proposes to publish more at length upon the subject. "Laboratory investigation of the subject," he says, "meets at the outset the difficulty of distinguishing results of weather changes from similar states otherwise caused. This difficulty is no greater than in many other topics of research, and, we believe, will not invalidate our methods and results."—Popular Science Monthly.

AN ELECTRIC TIME CHECK RECEIVER.

The illustration represents an automatic device for receiving the checks or tickets of employes in manu-



JARDINE'S ELECTRIC TIME CHECK RECEIVER.

facturing establishments, offices, etc., for which a patent has been granted to Charles K. Jardine, of Achuaran, Lismore, Oban, Scotland. The lower part of a box, of which a transverse section is shown in Fig. 2, has a drawer divided by a partition into two compartments, one of which has an inclined chute leading to a slot in the lower part of the drawer at the rear. In the top of the box is a time-check-receiving slot, beneath which is pivoted a lever, there being a plate attached to the lower end of the lever, while to its rearwardly curved upper end is pivoted a bar, at whose lower end is a roller, there being also in the bar a rod on which is a counterweight. An electro-magnet

is supported in the box, and its armature lever has rearwardly projecting lugs engaged by a bar connected with the curved upper portion of the lever beneath the check-receiving slot. Pivoted in the box is a lever carrying a plate with the words "early," "late," "closed," the extremity of the lever being slotted to receive a curved wire projecting from the bar carrying a counterweight. Fig. 3 shows the magnet and indicator. A conveniently located clock has a dial in which are holes to receive contact pins, which also pass into corresponding holes in an insulated ring at the back of the dial, one hole being opposite each hour mark and another fifteen minutes beyond the hour mark, and pins inserted through the holes into the ring being touched by the hour hand. The insulated ring and the clock movement are electrically connected with the magnet in the casing and a battery. When the pins are inserted in the dial, a check dropped in the slot before the hour for commencing work is passed from the chute to a receptacle outside the box, the indicator then exhibiting the word "early." When the hour hand arrives at the hour at which work begins, the curved lever beneath the slot is tilted to deflect the check into a compartment of the drawer, the indicator then showing the word "late;" but in fifteen minutes after the first contact, when the hour hand reaches the second contact, a check cannot be inserted, and the word "closed" is exhibited by the indicator, the apparatus remaining in this condition until it is reset.

An Old Horse's Memory.

Eleven years ago a horse was purchased for the fire engine Portland No. 2, on Munjoy Hill. This horse was called Old Tom, and it helped draw the engine for six years and was then disposed of. It has been drawing an ash cart of late years, and the other day went by the engine house. Engineer Loring, who knew the horse well, since they came to that engine in the same year and were there together for six years, fell into conversation with the driver and told him that he hadn't a doubt that if the old horse was put in his old stall, and the gong was sounded, he would rush for his place in front of the engine just as he used to do. The driver doubted this, and they agreed to try it. The old horse, now fifteen years old, was put in his old stall, where he had not been for five years. At the first sound of the gong he started for his old place under the harness in front of the engine. He tried to go quickly, but made only a sorry exhibition of nimbleness compared to his former habit.—Portland Daily Press.

THE AUTOMATIC LIFE SAVING APPARATUS OF DE ROPP.

M. De Ropp has utilized the liquefaction of gases in the manufacture of a life preserver. The apparatus gives the wearer entire liberty of movement until the moment arrives when the life preserver is required. It consists of a belt or sack of rubber which is normally flaccid and pliable, but which receives at the desired moment a quantity of liquid methyl chloride which, on expanding, is sufficient to completely inflate the sack. The liquefied gas is contained in a small flask terminating in a fine point which is introduced into the sack. A knife is held in place by a spring which is kept in position by a ring of filter paper which is destroyed on coming in contact with the water. The knife actuated by the spring, on being released by the band of paper, falls on a glass point, breaking it. The liquid then escapes into the sack, and, assuming the gaseous state, completely inflates it. The device can be disguised so as not to be noticeable. The inventor has also devised a signal for use by shipwrecked persons. The apparatus of M. De Ropp was experimented upon for the first time in the laboratory of M. Raoul Pictet. For our engravings we are indebted to La Nature.

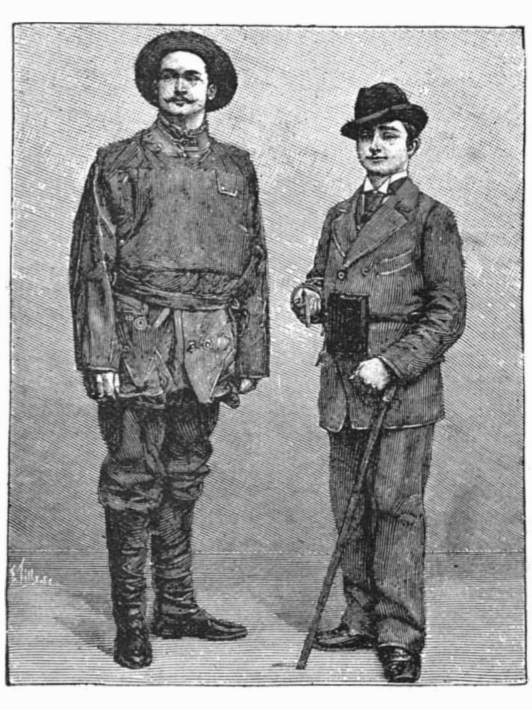


Fig. 1.—LIFE PRESERVER BEFORE INFLATING.

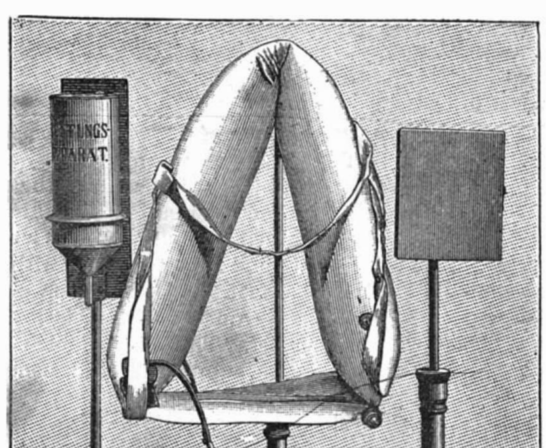


Fig. 3.—APPARATUS FOR TESTING THE LIFE PRESERVER.

Fig. 2.—LIFE PRESERVER AFTER INFLATING.

Scientific Enthusiasts.

It is a common error to think of science as opposed to all the poetry of life and scientists as the most cold and matter of fact men. In reality the true scientist is almost always a poet at heart, and the greater he is the more certain is he to be a pure enthusiast and of a deeply reverent spirit. Kepler, exclaiming in the moment of his great discovery, "O God, I think thy thoughts after thee!" is a type of this.

Professor Farrar, who occupied the chair of natural philosophy at Harvard University two-thirds of a century ago, was a man possessed of this enthusiasm for his work, and was beloved by his pupils, whom he inspired with something of his own spirit.

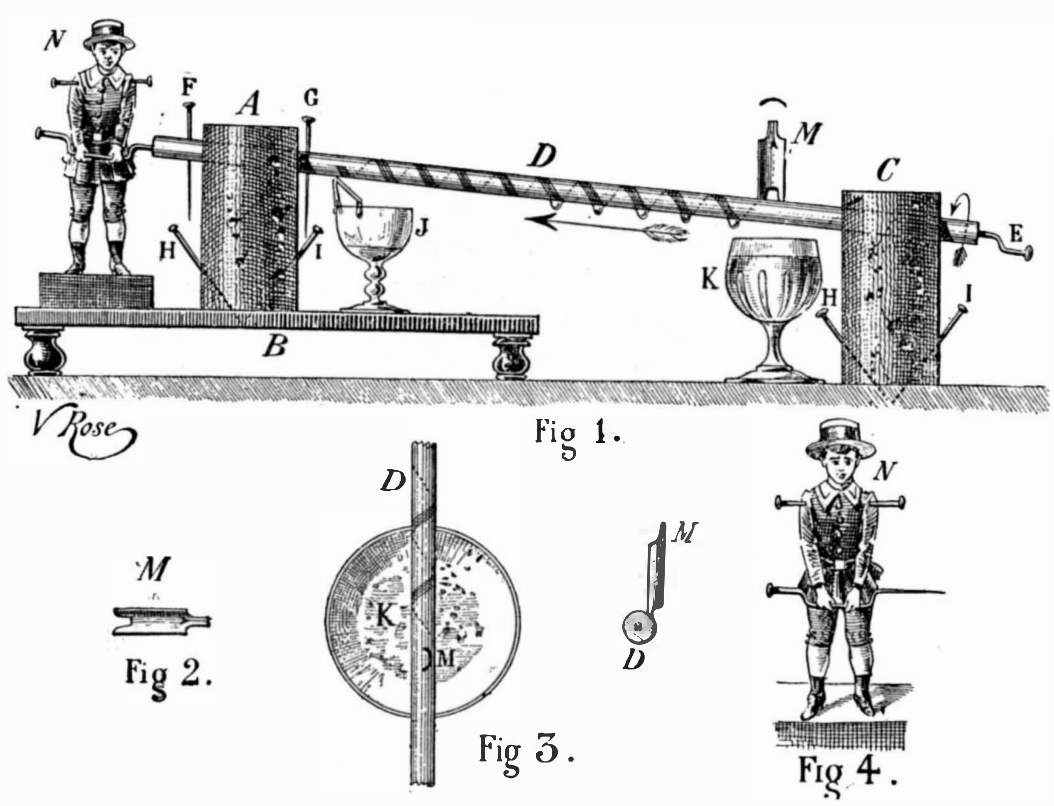
One day the class entered the lecture room and found the professor walking backward and forward with kindled eye and working face, holding a ball in his hand. Presently he stopped and confronted the class and exclaimed, suiting the action to the word:

"I toss this ball into the air; the earth rises up to meet it and the stars bow down to do it reverence!"

Probably no member of the class who heard these words ever forgot their absolutely accurate lesson—that action and reaction are equal; that the apple which falls to the earth at the same time draws the earth to itself in the exact ratio of their relative weight, and disturbs even the course of the planets and stars. Still less could they forget the grandeur and unity so vividly expressed in that brief imagery.—Youth's Companion.

AN ARCHIMEDEAN SCREW CONSTRUCTED FROM SIMPLE MATERIALS.

To perform this simple experiment take a long lead pencil, preferably an unvarnished one, and place it through two pierced corks, as shown in the engraving, one cork being placed higher than the other. The corks are adjusted so that the pencil turns freely. A bent pin, E, serves as a crank. The pencil is pierced by two other pins at F and G, which limit the motion of the pencil. Pins H and I hold the two corks firmly. A vessel of water, as a goblet, is placed at J, and another at K. The elevation of the glass, J, must be greater than that of the glass, K. On J is placed a bent match whose lower end is split to fasten it to the goblet. It is adjusted to almost touch the pencil. Then take a pen and cut it as shown in Fig. 2. This pen is forced into the pencil as shown in Figs. 1 and 3. Now fill the glass, K, with colored water so that the course of the water will be made more apparent. The colored water in K is now to be transferred to J, by the medium of the pencil, D, which acts as an Archimedean screw after the pencil has been scored spirally with a pair of pliers. The spiral begins at the pen, as shown in Fig. 3. Now turn the crank, E, in the direction shown by the curved arrow. The pen dips in the water and on rising carries a drop with it which is at last deposited at the beginning of the spiral. The drop is forced to follow the spiral until it strikes against the match. It then runs down into the glass, J. At each turn of the crank a drop is forced upward. If it is desired to render the experiment more comical, a paper or other kind of doll may be secured to the upper crank at N. For our engravings and description we are indebted to La Science en Famille.



ARCHIMEDEAN SCREW MADE FROM SIMPLE MATERIALS.

A Large Cargo Steamer.

The Hamburg-American Steamship Company has ordered from Messrs. Harland and Wolff, of Belfast, a twin-screw steamer of 20,000 tons burden, i. e., only 3,000 tons less than the Great Eastern. The vessel, when completed, will be the largest in the world. It is to be chiefly employed for freight, but will also be able to accommodate 200 cabin and 1,500 steerage passengers. The order has been given to a British yard, as its tender was more moderate than those of the German shipbuilders, and as the former contracted to deliver the vessel in 10 months, while the latter demanded to be allowed 19 months. The chief German dockyards are, it is stated in explanation, overwhelmed with work at the present moment.

OIL stoves and gas stoves should never be kept burning in a sleeping room, for they are burned in the open air of the room, and, having no connection with a chimney flue, they throw the poisonous carbonic oxide of combustion into the air of the apartment and make it unfit for respiration. Even an oil lamp is dangerous if left burning all night, but an oil stove is worse, because stoves generally feed more flame, consume more of the oxygen and give off more poisonous gas.

A HORSELESS CARRIAGE OF 1827.

In the London Observer of December 9, 1827, appeared a description of a steam carriage invented by a Mr. Gurney, and which is said to have been successfully tried in Regent's Park. As shown in the accompanying views, for which we are indebted to the Engineer, it will be seen that the vehicle was designed to serve the purposes of the horseless carriages on which so many inventors are now at work. The description of this steam carriage, written nearly seventy years ago, embraced the following interesting details and reflections:

It has a tubular boiler, constructed upon philosophical principles, and upon a plan totally distinct from anything previously in use. Instead of being, as in ordinary cases, a large vessel closed on all sides with the exception of the valves and steam conductors, which a high pressure or accidental defect may burst, and involve in destruction those in its neighborhood, it is composed of a succession of welded iron pipes, perhaps forty in number, screwed together in the manner of the common gas pipes, at given distances, extending in a direct line and in a row, at equal distances from a small reservoir of water, to the distance of about a yard and a half, and then curving over in a semicircle of about half a yard in diameter, returning in parallel lines to the pipes beneath, to a reservoir above, thus forming a sort of inverted horseshoe.

This horseshoe of pipes, in fact, forms the boiler, and the space between is the furnace, the whole being inclosed with sheet iron. The advantage of this arrangement is obvious, for, while more than a sufficient quantity of steam is generated for the purposes required, the only possible accident that could happen would be the bursting of one of these barrels and a temporary diminution of the steam power to one-fortieth part. The effects of the accident could, of course, only be felt within its own inclosure, and the engineer could, in ten minutes, repair the injury by extracting the wounded barrel and plugging up the holes at each end, for which purpose he would be provided with the proper materials; but the fact is, that such are the proofs to which these barrels are subjected before they are used, by the application of a steam pressure 500 times more than can ever be required, that the accident, trifling as it is, is scarcely possible; and the boiler now in use in Mr. Gurney's premises, on a similar construction, has remained as sound as ever after being at work every day for two years. Having thus described the boiler, we hope intelligibly, and having, we trust, removed all prejudice on that head, we shall now endeavor to render the other details equally clear. The boiler, we need hardly tell our readers, is the seat of the vital principle in the steam engine, for without that steam could not be engendered, and of course the works must stand still—our scientific friends will excuse us for being thus diffuse—and it will appear not a little singular that Mr. Gurney, who was educated a medical man, has actually made the construction of the human body and of animals in general the model of his invention. His reservoirs of steam and water, or rather "separators," as they are called, and which are seen at the end of our plate, are, as it were, the heart of his steam apparatus, the lower pipes of the boiler are the arteries and the upper pipes the veins.

The water, which is the substitute for blood, is first sent from the reservoirs into the pipes, the operation of fire soon produces steam, which ascends through the pipes to the upper part of the reservoir, carrying with it a portion of water into the separators, which, of course, descends to the lower part, and returns to fill the pipes which have been exhausted by the evaporation of the steam—the steam above pressing it down with elastic force, so as to keep the arteries or pipes constantly full, and preserve a regular circulation. In the center of the separators are perforated steam pipes, which ascend nearly to the tops, these tops being, of course, hermetically closed, so as to prevent the escape of steam. Through these pipes the steam descends with its customary force, and is conducted by one main pipe all along under the carriage to the end of the platform, which is, in point of fact, the water tank, where it turns under till it reaches two large branch pipes which communicate with the cylinders, from which the pistons move and give motion to the machinery. The cranks of the axle are thus set in action, and the rotary movement is given to the wheels. By the power thus engendered also a pump is worked —which is more clearly explained in our references—and which, by means of a flexible hose, pumps the water into the boiler, keeping the supply complete. The tank is to be replenished at the end of certain stages, by a very simple process; but it is calculated that it will hold sufficient—sixty gallons—for one hour's consumption. The furnace, too, within the boiler is also calculated to contain a sufficient supply of coke or charcoal for a similar period, and may be fed with equal facility.

So much for the boiler and its adjuncts, and now to the coach itself. In point of form, this vehicle is similar to the ordinary stage coaches, but rather larger and stands higher, the roof being nine feet from the ground.

The seats for the outside passengers are as usual; and

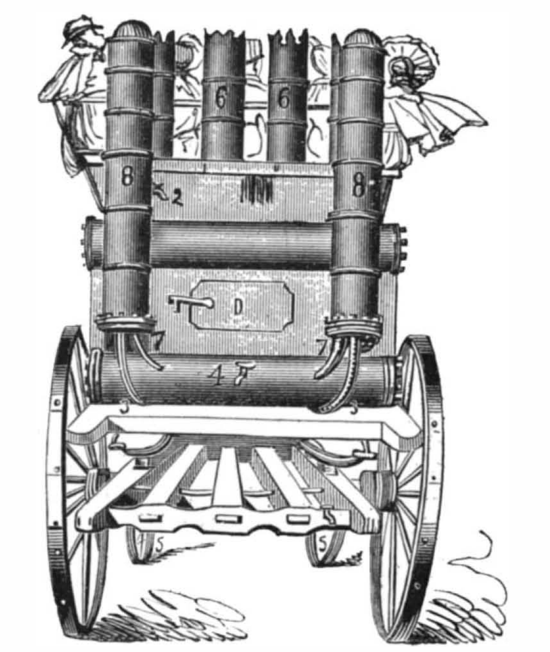


Fig. 2.—HORSELESS CARRIAGE OF 1827—REAR VIEW.

here it may be asked, whether those who ride in the back seats are not liable to be annoyed by the smoke from the chimneys of the furnace? To which we say no; for in the first instance, there is no smoke, coke or charcoal only being used; in the second, the chimneys are above the level of the seated passenger; and lastly, the motion of the carriage will always disperse the heated rarefied air coming from the flues.

The present carriage would carry conveniently six inside and fifteen outside passengers, independent of the guide, who is also the engineer. In front of the coach is a very capacious boot, while behind, that which assumes the appearance of a boot is the case for the boiler and the furnace, from which, we may add, no inconvenience whatever is experienced by the outside passenger, although in cold weather a certain degree of heat may be obtained if required. The length of the vehicle from end to end is 15 feet, and with the pole and pilot wheels 20 feet. The diameter of the hind wheels is 5 feet, of the front wheels 3 feet 9 inches, and of the pilot wheels 3 feet. There is a treble perch by which the machinery is supported, and beneath which two propellers in going up a hill may be set in motion, somewhat similar to the action of a horse's legs under similar circumstances, which assist the power of the engine in forcing the carriage to the summit, in case of snow, etc.

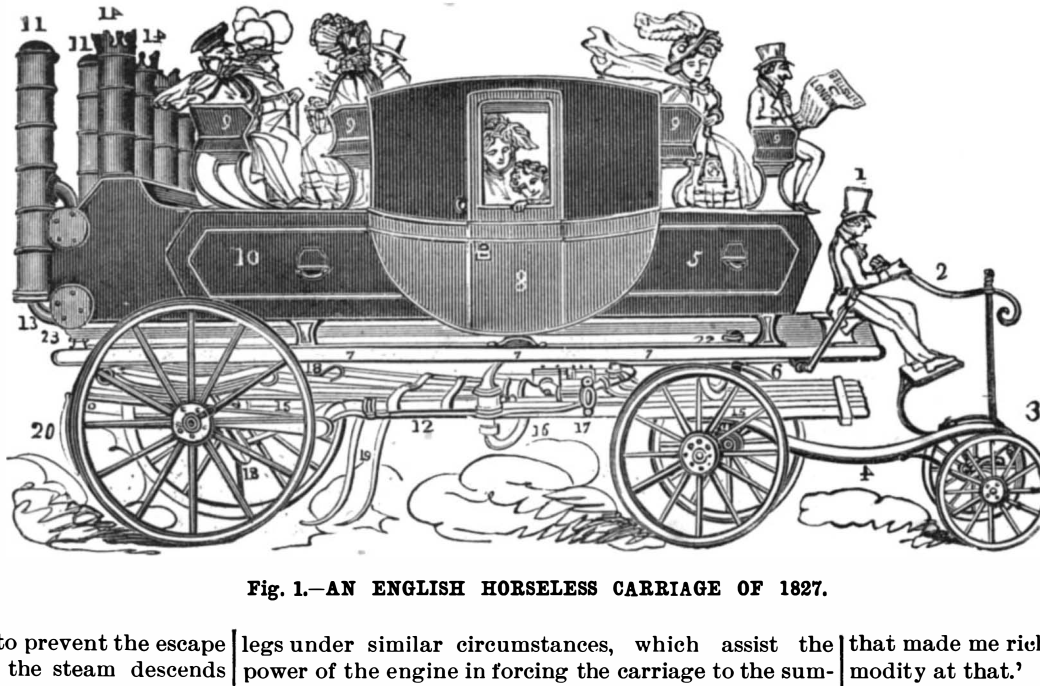


Fig. 1.—AN ENGLISH HORSELESS CARRIAGE OF 1827.

The total weight of the carriage and all its apparatus is estimated at one and a half tons, and its wear and tear of the road, as compared with a carriage drawn by four horses, is as 1 is to 6; the mischief done by the four horses, the feet of which act as picks, being five times greater. When the carriage is in progress the machinery is not heard, nor is there so much vibration as in an ordinary vehicle, from the superior solidity of the structure. The engine has a 12 horse power, but may be increased to 16; while the actual power in use, except in ascending a hill, is 8 horse.

Explanation of Fig. 1.—1. The guide and engineer. 2. Handle which guides the pole and pilot wheels. 3. Pilot wheels. 4. Pole. 5. Fore boot for luggage. 6. "Throttle valve" of the main steam pipe. 7. Tank for water, running from end to end, and the full breadth of the carriage; it will contain sixty gallons of water. 8. Carriage, capable of holding six inside passengers. 9. Outside passengers, of which the present carriage will carry fifteen. 10. Hind boot, containing the boiler and furnace. The pipes extend from the cylindrical reservoir of water at the bottom to the cylindrical chamber for steam at the top, forming a succession of lines something like a horseshoe turned edgeways. The steam enters the "separators" through large pipes, which are observable on the plan, and is thence conducted to its proper destination. 11. "Separators." 12. Pump. 13. Main steam pipe. 14. Flues of the furnace, four in number. 15. Perches, of which there are three, conjoined, to support the machinery. 16. Cylinders; there is one between each perch. 17. Valve motion, admitting steam alternately to each side of the pistons. 18. Cranks, operating on the axle. 19. Propellers, which, as the carriage ascends a hill, are set in motion, and move like the hind legs of a horse, catching the ground and then forcing the machine forward, increasing the rapidity of its motion and assisting the steam power. 20. The drag. 21. The clutch, by which the wheel is sent round. 22. Safety valve. 23. Orifice for filling the tank.

Explanation of Fig. 2.—1. The furnace door. 2. Gage cocks. 3. Steam pipes. 4. Blow cock. 5. Cock for emptying the water tank. 6. Flues of the furnace. 7. Pipes through which the water is propelled from the separators into the boiler. 8. Steam separators.

Advertising in the Drug Business.

Mr. M. W. Ryerson contributes to the Bulletin of Pharmacy a paper on judicious advertising for the retail druggist, giving the following examples of what an effort of this kind has accomplished:

"J. C. Ayer began life as a drug clerk and advertising his Cherry Pectoral in a small way, but when he died he left a fortune estimated at $15,000,000. C. I. Hood began 'that tired feeling' in a small way in 1870, and is now rated as a millionaire. A. B. Scott, of Scott & Bowne, was working at a moderate salary twenty years ago; to-day his firm is spending $1,000,000 a year for advertising. Brent Good, proprietor of Carter's Little Liver Pills, started on a cash capital of $8.40, and now cannot spend the money he is making; and many others the same way. Judicious advertising has made it possible for Seabury & Johnson to spend annually $50,000 on popularizing their products, W. T. Hanson Company $500,000 on Pink Pills for Pale People, and Wells, Richardson & Company $600,000 on Paine's Celery Compound. Dr. A. L. Helmbold was at one time a retail druggist in Philadelphia. He finally began the manufacture of his Buchu Compound, and put his entire surplus capital of $2,000 into a contract for one month's advertising, and in a short time, comparatively, was enjoying a clear income of $150,000 per year, besides spending as high as $250,000 annually in advertising. Orange Judd, the publisher, owed his first success largely to the mistake of his office boy in ordering a page advertisement instead of a column, as instructed. Moses P. Handy, of the Chicago Times-Herald, says: 'When I talk to a man who has made a fortune by advertising, I wonder that anybody who has anything to sell does not go and do likewise. One man told me a day or two ago that his concern, with a nominal capital of $160 000, only $30,000 of which was paid in, has divided in a single year among three partners profits to the amount of $750,000, and that exclusive of salaries of $50,000 and $25,000 drawn by two members of the firm. Ten or twelve years ago this man was a drug clerk on a small salary in a Western town [I wonder if it was in Nebraska], and is now one of the millionaires of New York. Without advertising I might have made a living,' he said, 'but it was advertising that made me rich, and advertising a very simple commodity at that.' Another man, who bears similar testimony, tells me that his concern, which began by investing $10,000 a year in advertising, increased the amount every year according to the increase of business, and this year expects to spend $1,000,000. Still another, who confined himself entirely to the newspaper and magazine in the exploitation of his specialty, never having touched a dead wall, a fence, or the broad side of a barn with poster or paint brush, and never employing a salesman, has a cool million salted down in real estate, keeps a yacht, and spends most of the year abroad in luxurious living."

ROQUEFORT cheese is made of sheep's milk.

THE OTIS ELEVATING RAILWAY.

The eastern end of the Catskill range has been a favorite mountain resort for many years. Until within a short time the hotels on the top of the mountain were accessible only by a tedious stage ride up the face of the mountain, or by the rather circuitous route of the Stony Clove Railway, running from Phoenicia, on the Ulster and Delaware Railway, to the top of the mountain.

Recently an inclined railway has been built up the side of the mountain lying toward the valley of the Hudson, and extending from Otis station, on the Catskill Mountain Railway, nearly to the top of the mountain. This railway is known as the Otis Elevating Railway, having received its name from the firm of Otis Brothers, the well known manufacturers of elevator machinery.

The road is 7,200 feet long, with a rise of 1,600 feet It runs in a straight course down the mountain without any lateral deviation, but it is not a true inclined plane. It is made up of four curves, two of which are circular while two are parabolic. This plan has been worked out by the engineer, Thomas E. Brown, to secure, as far as possible, the balance of the two cables used in moving the cars, the cables alone weighing ten tons each.

The engines which operate the cables are located at the upper terminus of the railway, within about three hundred feet of the old Catskill Mountain House, which is seen in the general view. The engines are of the Corliss type, built by the Hamilton Corliss Engine Works. They are seventy-five horse power each at one-fourth cut-off, the diameter of the cylinders being twelve inches, the length of the stroke being thirty inches. The shaft, which is common to both engines, is provided with two brake wheels, which are each encircled by a brake strap. The shaft also carries a pinion which engages a spur wheel on the shaft of one of the cable drums. The driving cable drum has a loose rim provided with a grooved periphery which receives the cables, the rim being carried by friction. The other cable drum simply supports the cables. The cables, which are connected up parallel, are attached to one car, and passing twice around the drums extend out of the engine house around a sheave, thence to the other car.

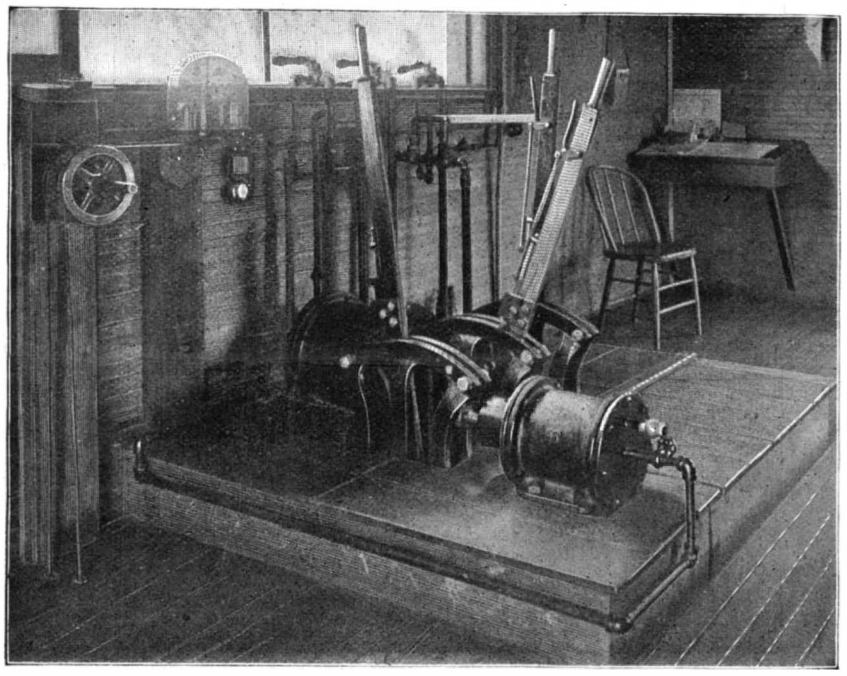
The track, as will be seen by reference to the general view, has three rails, the center one being common to both cars, there being a separate outer rail for each car, except at the turn-out, shown in the general view, about half-way up the mountain. Here for a very short distance the tracks separate into separate and distinct two-rail tracks. With this arrangement, it will be seen that when one car goes up the other must necessarily go down, and, so far as the cars themselves are concerned, they balance each other.

The cars have a seating capacity of ninety passengers, a caboose being provided for a proportionate amount of baggage. The seats are like those used in the elevators of the Eiffel tower, being constructed on a curve which enables the passengers to easily adjust themselves to the different inclinations of the railway.

To the ties on each side of the central rail are secured heavy timbers which extend from one end of the railway to the other, and upon each car is firmly attached a clutch capable of gripping this timber upon the top and sides. The clutch is under the control of a governor which rolls on the top of the timber. Any considerable increase in the speed of the governor releases the clutch and causes it to be thrown forcibly into the timber, thus instantly arresting the downward motion of the car. The two cables are also attached to a swivel plate upon each car, which is connected with the clutch mechanism, so that should one of the cables fail, the other will turn the swivel plate and cause the clutch to engage the timber. The clutch can also be operated by hand at the will of the conductor.

Upon the cable-driving drum is placed a strap brake which, together with the brakes on the engine shaft, is operated by air pressure. The engines are provided with link motion, and the shifting of the engine may be effected by means of an air cylinder in the tower above the engine room. In fact, all the controlling mechanism may be operated by simply turning air valves connected with the air brake system, and to insure the stopping of the cars at the ends of the road a lever is provided, which is moved by the car so as to throw into action the engine-controlling levers and brakes, to immediately stop the engine and to hold the cable securely in the position in which it is stopped.

In the tower in front of the controller is a governor driven by the engines below, which indicates the maximum speed by closing an electric circuit and ringing a bell. A wire extends from one end of the road to the other for electric signaling, and a telephone system has been provided, by means of which telephonic communication may be had between the cars and between the cars and the stations at the ends of the road. The passengers as they are carried up this road survey a magnificent scene which can never be adequately produced on canvas. For the details here presented we are indebted to C. F. Parker, assistant engineer.



CONTROLLING MECHANISM OF THE OTIS ELEVATING RAILWAY.

Passenger Car Improvements Wanted.

Although the summer of 1895 has now departed, the ever-present and perplexing question of the ventilation of passenger cars is still here. It is true that the question of ventilation will soon assume a different phase; will become a question of how to get warmth into a car instead of how to get it out; but the troubles of the day car passenger in summer are very real, and will recur again next summer as surely as the world rolls round, and possibly some of us who may have problems in this field to settle then would do well to begin considering them now. The criticisms and complaints of passengers, which are the sharpest incentive for action in this matter, are now at their height, and there are more of them (counting only the intelligent ones) than ever before. Their intensity is, of course, greatest at the end of August, when the charms of summer have been mostly transformed into commonplace vexations, and every one is growling at something or other.

A sample criticism is that of a Buffalo correspondent, writing to the New York Tribune. He says:

"Have the railroad authorities no rules for regulating the indiscriminate ventilation of passenger cars by private individuals? The other day, in going from New York to Buffalo, it was my fate to sit behind an untraveled barbarian who persisted in keeping the window open during the entire journey. I was thus forced to ride for eleven hours in a hurricane of smoke and cinders that nearly put my eyes out, and left me with a cold, from the effects of which I have not yet recovered. It was useless to appeal to the conductor, he having no authority over the action of passengers in such cases, and equally useless to try a change of place. The fresh air fiend seems to have a devilish instinct for establishing himself on the front seats, whence the cyclone of dust and dirt in which he revels may sweep through the entire car, to the discomfort of the greatest number of victims.

"Now, I would respectfully suggest that the railroad authorities themselves take this matter in hand and remedy the abuse, as they can easily do, with perfect equity to all parties, by setting aside a certain number of seats in the rear of each passenger coach for those who enjoy the current of 'fresh air' that follows in the wake of a locomotive, and absolutely prohibiting the opening of windows in the forward part."

Other correspondents followed, suggesting various remedies. One wants at every window a screen, such as is used in Pullman cars, to be removed only by the conductor or brakeman. A New Jersey woman says that she raises her umbrella in front of her and thus causes the cinders to fall upon the vicious person who is the cause of the trouble, and these cinders, even though they are cold, have the well-known moral results of coals of fire when they fall upon the malefactor's head. A more businesslike woman, Fanny Kellogg, says that she pins a stout newspaper up in front of her, fastening it to the side of the car and to the back of the seat by three stout, ordinary pins.

The reader will have noted by this time that our title, which had to be short, does not precisely define our subject; that this is not intended to be an essay on methods of ventilation proper. That problem has well known limitations which we do not care to disturb at this time. The present question is, Assuming that we must admit to the cars in summer a large supply of outdoor air, not too much when the train is running rapidly, and yet all that we possibly can when it is standing at a station, how can we avoid dirt and objectionable draughts?

The Buffalo man must have seen, without being told, that suitable rules cannot be formulated, much less enforced. The assignment of back seats would be harder to manage even than the car seat hog question. Windows not to be opened would have to be locked, and that would make trouble, for our complainer himself would want his window open some of the time. The brakeman, even if he be an accomplished hotel clerk, cannot attend to forty windows all at once. Theoretically, he might lock all the windows simultaneously by time locks electrically controlled, soon after leaving the heating chamber, commonly termed a head house, and open them before the next stop; but practically, even if this mechanical suggestion were reasonable, he could not suit the passengers by such a method. The temperature of a well-filled car rises so rapidly when the openings are closed, and the draughts so easily become violent when windows and doors are opened, that no one person could think of pleasing a carfull. Even with windows bolted down and the patent crank's ideal ventilating apparatus in full operation, our troubles would not be half cured.

Probably we shall always have to have openable car windows. That much must be conceded to the traditional spirit of American independence. With 40 windows and 40 sovereigns in a car, what shall we do? Any observant traveler will often have noticed that if each passenger could control the window opposite the seat in front of him he would be much better off than now, even with the control of his own window taken out of his hands. But this is out of the question, for a large share of the people who travel are much like the Englishwoman who would hold no intercourse with one to whom she had not been introduced, even when she was drowning. We are inclined to think that the Tribune correspondents have the germ of the most practicable idea. A folded newspaper is not available in the majority of cases, and not every one could adjust it in good shape with "three stout, ordinary pins," even if he had them; shields outside the window would not probably prove a practicable and satisfactory solution, for they could not be attended to without additional porters, and the passengers would break or lose them rapidly if left to themselves. But a shield inside the car, Fanny Kellogg's newspaper changed into a wooden or metallic shield, shaped scientifically and attached to the car so as to be conveniently opened or closed, ought to be a very satisfactory contrivance. There must be an ample supply of ingenuity in the car shops to make the right thing. It would be desirable to have such a shield normally in position, so that a passenger would have to take action only when he desired to have the breeze from his neighbor's window, and to accomplish this, while not obstructing the light or impairing the cheerfulness of the car, might be somewhat difficult, but not impossible.—Railroad Gazette.

A Remedy Against Fleas.

All persons who have lived in a house which has become infested with fleas in summer will know how these creatures inhabit the floor by preference, and how they will jump upon the legs and ankles of every one who passes near them. Taking advantage of this fact, some years ago, when the lower floor of McGraw Hall of Cornell University was badly infested by fleas, which had come from animals temporarily kept there in confinement, Professor S. H. Gage invented the following ingenious plan. He had the negro janitor put on a pair of rubber boots, and then tied sheets of fly paper, with the sticky side outward, around the legs of the boots. The janitor was then told to patrol the lower floor for several hours a day. The result was gratifying and rather surprising. The sheets of fly paper soon became black with fleas and had to be changed at intervals, but by this means the building was almost completely rid of the pest, with a minimum of trouble to every one except to the janitor.—Insect Life.

E. BURINSKY's method of restoring by photographic means the writing faded to invisibility of old documents is as follows: He obtains a number of pellicular negatives, superposes them exactly on one another, and thus, under a suitably regulated light, renders them visible.

MANUFACTURE OF WAGON SPRINGS.

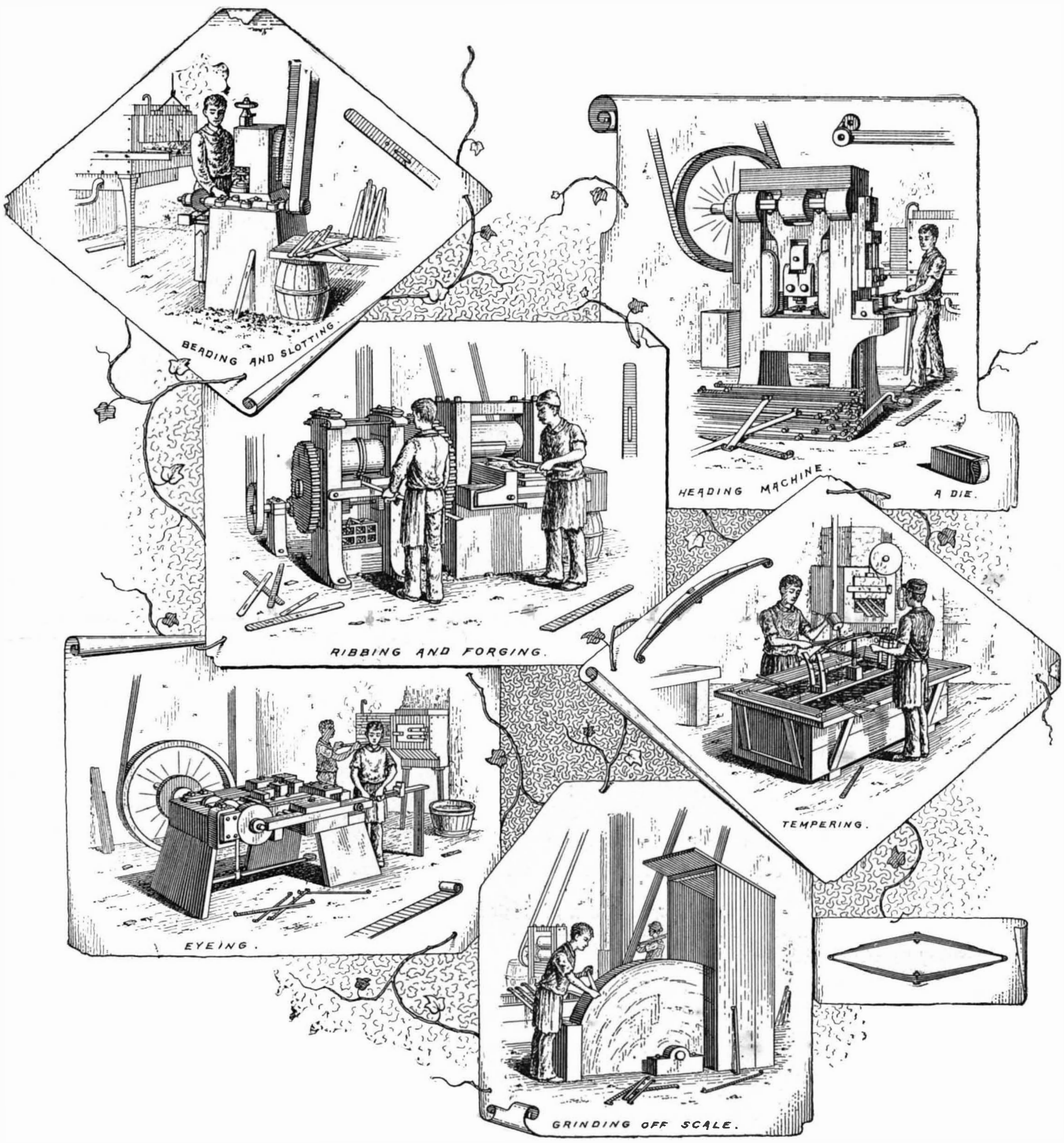
Wagon, coach and truck springs are manufactured from high grade bars of spring steel. The bars range from 1 to 3½ inches in width and from ⅛ to ⅜ of an inch in thickness and are about 25 feet in length.

The material is first cut up into plates or leaves, then heated and passed through a number of processes called forging, ribbing, slotting, heading, eyeing, etc., after which they are tempered and polished and then bolted together. The bars of steel are cut up cold, the shears of the machine with a pressure of 2½ tons making about 70 clean cuts per minute. The plates or leaves are then placed into a blast furnace and heated. The furnaces are about 2 feet in length, 1½ feet in width, 2 feet in height and lined inside with firebrick. The plates are taken out of the furnace when at a white heat and squeezed by a ram connected to the forging machine, it being the end of the heated plate is placed into the machine, the blade presses the material into the slot, the plate when taken out having a rib formed into it about 6 inches in length, about $\frac{3}{16}$ of an inch in depth and about ¼ inch in width. The depth of the ribs varies according to the thickness of the plate. The rolls travel at the rate of about 100 revolutions per minute. The operation of beading and slotting a spring is done by means of a punch and a circular saw. The plate is first brought up to a white heat in the furnace, the attendant then placing the material in position in the machine, then by means of a lever the saw is set in motion, which cuts out a slot in the hot plate about $\frac{3}{16}$ of an inch in depth, about 2 inches in length and about ¼ inch in width. The saw is about 6 inches in diameter, ¼ of an inch in thickness, with teeth about ¾ of an inch in length, and travels at the rate of 3,500 revolutions per minute. heads is about 4 tons. The machine makes about 75 strokes per hour.

The eyes are formed by means of dies, it taking five movements to perform the operation. The plate is heated as before and placed into the machine, the dies being formed in such a manner that with every stroke of the machine a part of the eye is formed. The attendant, as soon as each stroke is made, lifts out the plate and places it in position for another, the shifting of the plate being continued until the eye is completed, the whole operation taking about one minute. The plates are then tempered.

This operation requires an experienced person, who must understand thoroughly about the expansion and contraction of steel, and be able to tell at a glance whether the plates are straight.

The plates are first heated to a bright cherry color, the attendants then placing them on a sort of frame



THE WAGON SPRING INDUSTRY.

necessary to thicken and narrow the ends of the plates so that when they pass between the forging rolls of the machine they are pressed back into just the proper width. Connected to each forging roll is a cam about 1 foot in length and about 8 inches in width. They are fastened securely one above the other in the center of the roll, each projecting out from the surface about ⅛ of an inch. The ends of the hot plate after being squeezed are placed between the cams, which, revolving at the rate of 100 revolutions per minute, presses or flattens out the material to the length of about 6 inches, the operation thinning and giving spring to the ends. About 100 double ends or leaves can be forged per hour.

If the spring is to be ribbed the plate or leaf is passed to another machine which presses or forms a rib into the material, so that in placing one plate over another the projecting side fits into the other, making it impossible to shift. The upper roll of the ribbing machine is slotted in the center. Connected to the under roll is a steel blade or gouge, which when in motion passes into the slot of the upper roll. When The burr is then milled off and the plate beaded. The beading is done by means of a circular punch which forces the hot metal into a die. The hole is forced partly through, leaving a circular projection on the under side. The punch forms a hole about $\frac{3}{16}$ of an inch in depth. The machine beads and slots about 100 double ends per hour. The ends are then trimmed off in different shapes, such as oval, round, diamond and square. The plates are trimmed cold, the knives making about 100 strokes per minute.

The plates are then punched through the center, the holes ranging from ⅜ to ½ inch in diameter. The heading machine welds two pieces called the head to the ends of the plate at one blow. The attendant first fits the pieces, which are slotted on the sides, to the end of the plate. They are then put into the furnace and brought up to a white heat. The hot steel head is then placed in position on the bottom die in the machine. By means of a lever the attendant drops an upper die, which welds the material together, forming the head of the spring. The ends are then trimmed and punched. The pressure required for welding the and pinching them one on top of the other into the proper shape with instruments made for that purpose. Water is then poured on as soon as the plates turn a dull cherry color, the attendant pouring on just enough to properly temper them. Two men temper about 40 springs per day.

The spring plates are then taken to a 6 foot grindstone, where the scale is taken off and the plates polished. This stone travels at the rate of 250 revolutions per minute, and is 14 inches in width and 3 tons in weight. After the grinding operation, the heads are rounded off on an emery wheel. They are then put together and bolted. The springs range from 32 inches to 48 inches in length, and from 1⅛ inches to 3½ inches in width. The plates on each spring range in number from 2 to 30. Fifteen hands turn out about 80 ordinary springs per day. The sketches were taken from Merrill's Spring Works, Jersey City, N. J.

THE brain of a woman is smaller than that of a man, but it is stated to be somewhat larger in proportion to the weight of the body.

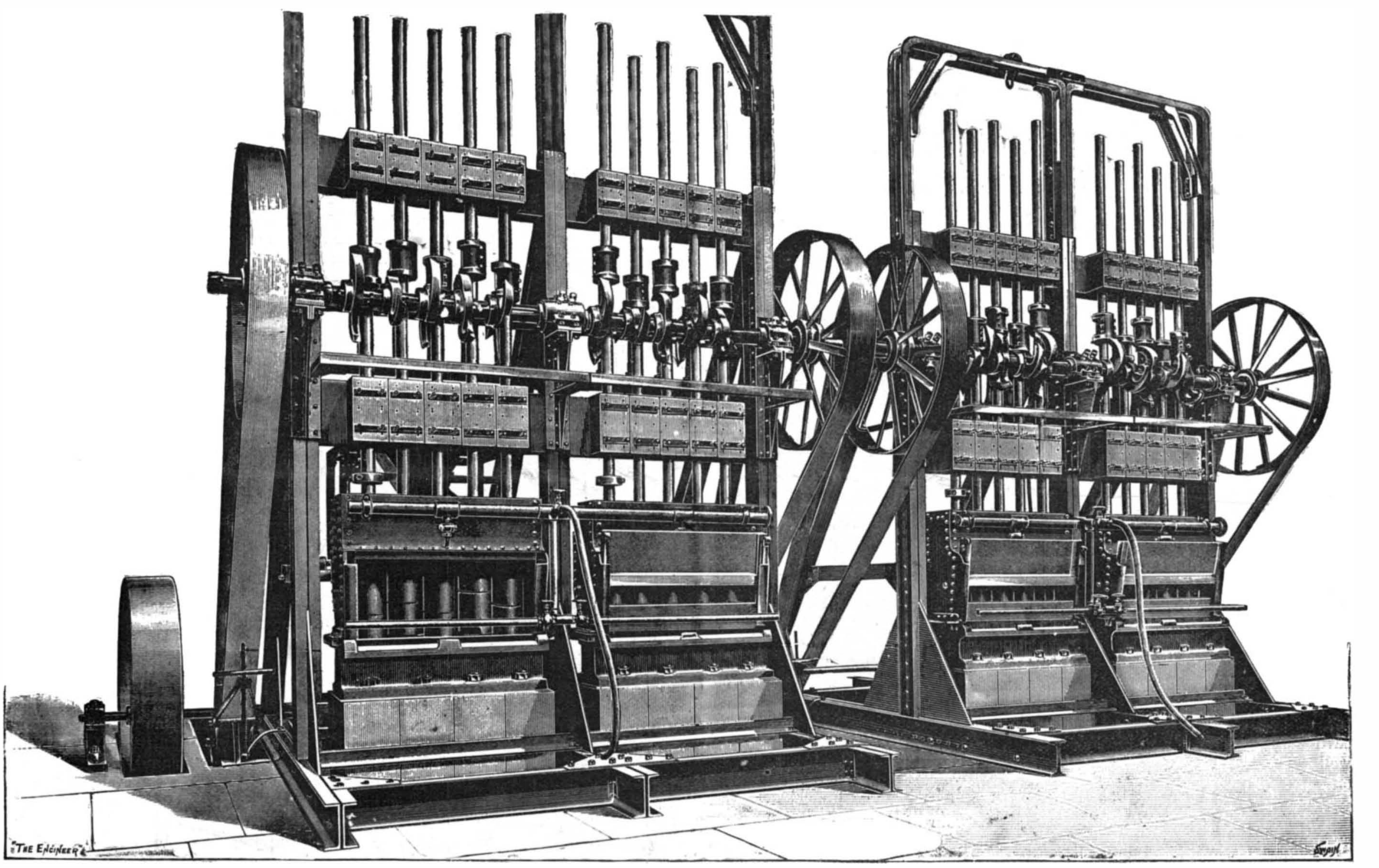
IMPROVED STEEL FRAME STAMP BATTERY.

The illustration is taken from a photograph of a twenty-head stamp battery recently supplied for the Gold Coast of Africa, in a district where it is impossible to have wood, owing to the climate and ravages of insects. In this battery all joints are planed and fitted, with the holes drilled in position. The battery was first erected complete at the works, and all the parts carefully marked and photographed, rendering the re-erection at the mine a simple matter. It is built up in sections of 250 lb. where transport is difficult and costly, or in sections of 30 cwt., as desired. All the parts are so constructed that they are not easily damaged in transport. All the bolts are fitted with lock nuts, and rivets are supplied for riveting up at the mine when required. The battery is arranged in sections of two of ten heads each, having five heads in one motor box, each five heads being driven by an independent steel pulley, so that any section can be stopped without the others.

The belt from the countershaft to the stamp is of leather, of ample width and section, and an improved belt-tightening gear is fitted to each belt. The countershaft is of steel, turned and polished all over, fitted with bearings, having gun metal steps of large surface, lubricators, pulleys for driving the stamps, couplings, and loose collars fitted with steel set screws, and main driving pulley for receiving power from the engine or turbine, constructed of steel, turned up and bored perfectly true and fitted with key and keyway. The cam shafts are constructed of the best mild steel, turned and polished all over, and each fitted with five steel cams of massive design, bored and trimmed up true on the outer face, and having lifts from 6 inches to 12 inches as required. The cam shaft bearings are of massive design, and fitted with oil catchers, gun metal steps and improved lubricators. The stems are of tough wrought iron, turned all over, and each tapered to enable them to be reversed. Each stem is fitted with a hard chrome steel tappet fitted with three keys. They are faced on the top and bottom sides, so as to be reversed when worn. The shoes are of chrome steel, with heads of wrought mild steel bored out so that either end will fit the stem and the shank of the shoe, suitable slot holes being provided so that the stem and shoe can be removed; the whole design gives a falling weight of 850 lb. Each head of stamps is fitted with fingers for propping up.

The motor boxes are of the Homestake pattern, of massive design and construction, and are either made whole or in two parts, or in sections of 250 lb. as required. The boxes shown in the illustration are in two parts, the lower parts being of cast iron and the upper part of wrought steel, fitted together with planed joints, and through bolt holes and lock nuts. Each box is fitted with five dies of Messrs. Robey's special chrome steel, fitted with hexagons on the lower edge to prevent turning in the box. If desired, the top part of the motor box can be made of steel plates, having an internal lining, and fitted complete with water-distributing pipes, and arranged to receive amalgamated copper plates when required. The grate frames are of an improved design, fitted with chock blocks and thick amalgamated copper plate, whereby the depth of discharge can be altered at will. Hose pipes and cocks are supplied for washing out and cleaning the launders. The launders are supplied complete with arrangements for altering the angle of the launders, and each set of five heads has an independent amalgamated copper plate surface of large area, and fitted with a frame for supporting the launders clear of the battery framing.

Australian mercury wells are fitted at the end of each launder, and the outlets arranged to convey the tailings over blankets or settlers as may be required. The automatic feeders can be constructed of wood or wrought iron framing. A runner and hook with framing are provided to lift the stamps, etc. The sizes of battery usually supplied are 650, 760, 850, 900, and 1,000 pounds, having a maximum fall of twelve inches at ninety blows per minute.



IMPROVED STEEL FRAME STAMP BATTERY.

We are indebted to the Engineer, London, for our illustration and the foregoing particulars.

The Perfect Fender.

The commission appointed by the city of Providence, R. I., to examine and report on the fender question, reported in part as follows :

"Having examined the reports of the various commissions appointed in Baltimore, New York, Brooklyn and Philadelphia, your commission proceeded to examine into the merits of various patented and other devices, some with and some without working models, that were exhibited before them by various persons. Of these contrivances, only four were regarded with favor by your commission. But your commission do not consider that these fenders are perfect. No fender should be adopted without a wheel guard, which, in the opinion of the commission, should extend entirely around the car.

"Your commission are convinced that the most successful device for saving life on street railways is a light projecting fender which shall readily pass over without injuring the human form which it may fail to trip and catch, or which may be already prostrate; and which is supplemented by a wheel guard close as possible to the wheel, to be brought into action automatically, rather than by the foot of the motorman, and provided with powerful springs to bring the guard into contact with the rail and street surface, but it is the opinion of your commission that there is not any fender that is always sure to save life. A good, intelligent motorman is the best preventive of accidents on street railways, and to that fact, perhaps, is largely due the immunity we have had in Providence from frequent accidents during the three years the electric cars have been in operation.

"The managers of the railroad company have afforded the commission every assistance in the consideration of this subject, and have provided cars at all times upon which to test the various fenders submitted for trial. They have agreed to equip their cars with suitable wheel guards and with one of the fenders selected by your commission just as rapidly as it is possible to build them."

A New Photographic Paper.

Within recent years the large consumption of ready prepared printing-out papers has demonstrated their superiority in cheapness and convenience to the regular albumen paper, which has to be freshly prepared every time prints are to be made. Thus there are prepared papers made of varying degrees of sensitiveness. The gelatino-bromide paper has the highest, and one time was used extensively in the camera for the making of paper negatives.

Lately a new paper called "Velox," prepared by the Nepera Chemical Company, has been introduced, which appears to be a combination of a chloride and bromide. When exposed to the same light, it prints 500 times as quick as albumen paper. In diffused daylight an exposure of a few seconds only is required; prints also may be made quickly if it is exposed to the Welsbach gas light or the electric arc light.

After exposure, the paper is placed in a developing solution, the image coming out slowly and certainly. It is then toned and fixed in a combined hypo and alum solution, and washed in the usual way.

The photographer is able to make prints with this paper independent of the condition of the weather, and thus fill orders promptly; a case in point being cited of 2,500 prints being finished in two days, from one negative.

The prints are permanent and resist humidity and heat to a remarkable degree, making the paper well adapted for use in warm climates.

Another valuable feature of the paper is that the manipulations can be carried on under a bright yellow light, lamp light, or weak diffused daylight. We have tried the paper, obtaining very satisfactory results.

FRANCE has furnished fewer immigrants to the United States than any other nation in Europe. During the ten years preceding 1890 only about 50,000 persons left France for America.

Stains and Their Removal.

It is, perhaps, hardly necessary to say that stains should be treated as speedily as possible after their first appearance. When once dry they are more difficult to remove, requiring both time and perseverance. Paint should be instantly wiped off; grease on wood, stone or carpet should be congealed before it has time to penetrate, by throwing cold water over it. Tea, coffee, ink, wine, and fruit stains will disappear in a quarter of the time if they can be attended to while wet. Spots on colored material must not be rubbed, but dabbed over and over again until they disappear. Rubbing roughens the surface and often leaves a whitened circle almost as unsightly as the original stain. The dabbing is best done by covering a finger with an old handkerchief frequently changed, and great care should be taken to confine the operation to the area of the stain itself, and not to extend the damage by damping and dabbing the surrounding material. In the treatment of stains, to know what you mean to do, and to do it quickly and neatly, is more than half the battle. We will take stains on white washing materials first.

For acids, tie up a bit of washing soda in the stained part, make a lather of soap and cold soft water, immerse the linen, and boil until the spot disappears.

For anilines, wet with acetic acid, apply diluted chloride of lime, and wash out carefully.

Apple and pear stains may be removed by soaking in paraffine for a few hours before washing.

Blood, if fresh, is removed by soaking for twelve hours in cold water, then washing in tepid water. If the mark still remains, cover it with a paste made of cold water and starch, and expose to the sun for a day or two. Old stains require iodide of potassium diluted with four times its weight of water.

For coffee and chocolate, pour soft boiling water through the stains, and while wet hold in the fumes of burning sulphur.

Fruit stains can be treated in the same way if fresh, but if old rub them on both sides with yellow soap, cover thickly with cold water starch, well rub in, and expose to sun and air for three or four days. Then rub off the mixture and repeat the process if necessary.

Grass stains are removed by alcohol.

Ink requires milk for its removal; the spot should be soaked and gently rubbed. A fresh stain will disappear quickly, but an old one may need soaking in milk for twelve hours.

For iron mould, spread the stained part on a pewter plate set over a basin of boiling water, and rub the spots with bruised sorrel leaves, then wash the article in soft warm suds. Or, cover the spots with a paste made of lemon juice, salt, powdered starch, and soft soap, and expose to the sunlight.

Mildew can be removed by the above paste, or by simply wetting the spots, covering them with powdered chalk, and bleaching on the grass.

Paints must disappear before turpentine and perseverance.

Scorched linen can be restored if the threads are not injured. Peel, slice and extract the juice from two onions, add half a pint of vinegar, half an ounce of curd soap, two ounces of fuller's earth, boil these well, and, when cool, spread over the scorch, let it dry on, and then wash out the garment.

Tar can be taken off with petroleum.

Tea stains yield to the action of boiling water poured through them from a height, or to glycerine.

Wine stains, if old, treat like old fruit stains; if fresh, table salt spread over the spots while wet will neutralize the damage.

Stains of which the cause is unknown will frequently disappear if held in a pan of milk boiling on the fire, or by dipping them in sour buttermilk and drying them in the sun. The articles should then be washed in cold water, dried, and the process repeated several times in the day. The following bleaching liquid will effectually remove any trace that may still remain after the garments have been through the laundry. It may be called an instantaneous ink and stain extractor, but requires to be used with care lest the fabric suffer. Put a quarter of a pound of chloride of lime and a quart of soft water in a wide-mouthed bottle and shake it well. Cork tightly for twenty-four hours, then strain through cotton and add one teaspoonful of acetic acid to every ounce of the mixture. Damp the stain, apply the extractor, and wash well in clear, soft water.

For the removal of stains and spots from colored materials and carpets, ammonia takes the first place. Almost any mark, new or old, will yield to its persevering use, and if dabbed on (not rubbed) it will itself leave no trace of its use. It can be applied to woolens, cottons, and silks. It will remove ink spots from marble, paper, and wood. Grease flies before its application; and when diluted with water, spots caused by orange or lemon juice or vinegar are removed by it from the most delicate materials. For very nice fabrics some people like to use the old-fashioned javelle water, to be obtained from the chemist, but ammonia, delicately applied, does quite as well. From carpets, curtains, and suits of clothing it will remove almost every stain, including that caused by whitewash. Ink spots are always the most difficult to efface. Take up as much of the ink as possible with a spoon and blotting paper, and then use milk or clear water until it disappears, being careful not to extend the area of damage done by rubbing the ink into the adjacent material. Benzine will remove paint from delicate fabrics; if it fails, turpentine must be used, and the mark which it leaves effaced by alcohol. If in the process of removing stains the color departs from the material, it can generally be restored by dabbing with chloroform.—Dyer and Calico Printer.

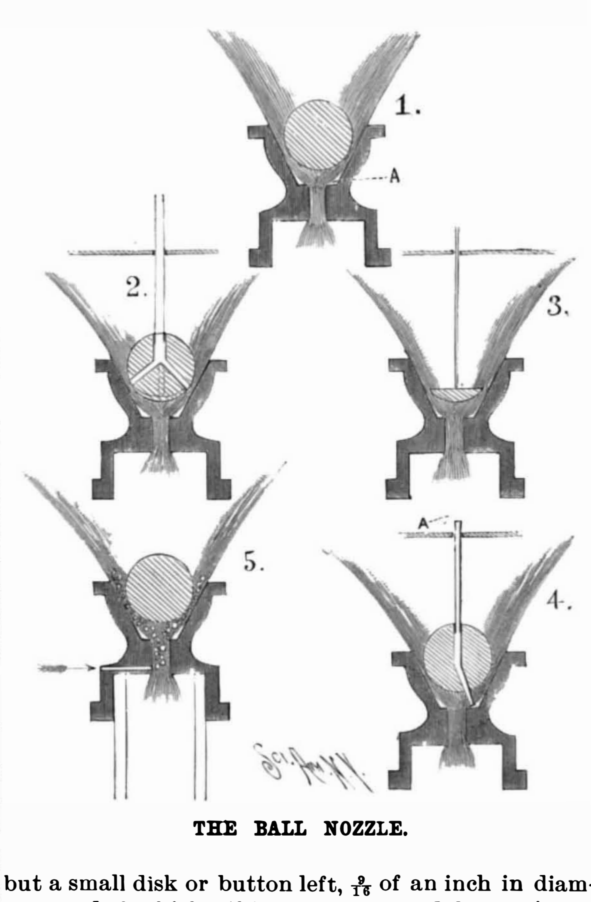
Correspondence.

THE BALL NOZZLE.

To the Editor of the SCIENTIFIC AMERICAN:

Not being entirely satisfied with your explanation of the phenomenon of the ball nozzle, we procured one, and find that the vacuum is located at A, Fig. 1, instead of at the point where the water is tangent to the ball. The following experiments, we think, will prove it: We drilled a hole in the ball, Fig. 2, about ⅛ inch in diameter, and half way through the ball from that we drilled three others to the point where the water is tangent to the ball. In the larger hole we inserted a stiff tube and passed it through a hole in the cross piece above the nozzle; that held the ball in the position shown in the figure, but left it free to be thrown out. If the vacuum was at the point of tangency, the air passing down the tube and out at the side would fill it and the ball would be blown out, but the ball remained in the nozzle.

We then cut the ball down, Fig. 3, until there was



THE BALL NOZZLE.

but a small disk or button left, $\frac{9}{16}$ of an inch in diameter and $\frac{3}{16}$ thick; this was supported by a wire as shown in the figure; the pressure was not great enough to carry it out.

The only place then remaining that a vacuum could be formed was below the water above the shoulder of the nozzle. To prove that the vacuum was at that point, we drilled a ball as shown in Fig. 4, and in the lower opening inserted a tube $\frac{1}{16}$ of an inch in diameter, letting it project beyond the ball about ⅛ of an inch, just enough to carry it below the water; the upper tube was passed up through a cross piece as shown in the figure.

We found that the air passed down the tube, filled the vacuum; and the ball was thrown out.

The opening in the tube at A, Fig. 4, was then closed so that the air could not pass down the tube to the vacuum; the ball would then remain in the nozzle.

We think that the above experiments prove that the vacuum is at A, Fig. 1, and not at the point where the water is tangent to the ball. N. W. GREEN.

Albert Lea, Minn., September 6, 1895.

[We think the experiments of our correspondent fail to prove anything derogatory to our explanation to which reference is made; on the contrary, they seem to prove our theory correct. We admit a vacuum is formed at A in Fig. 1, as pointed out in the above letter; but this would be insufficient of itself to cause the retention of the ball in the nozzle. The admission of air at three or more points in the vacuum zone in the manner shown in Fig. 2 would only destroy the vacuum at those points. The vacuum would still be sufficient to retain the ball.

When air is admitted through the tube A to the space A, it is distributed sufficiently to reduce the vacuum at the surface of the ball and elsewhere in the nozzle, so that the ball is thrown out by the water jet. In Fig. 5, which we have added, is shown an experiment in which air is admitted to the smaller part of the nozzle. This is distributed through the water, preventing the formation of a vacuum anywhere in the nozzle, consequently the ball will not be retained in the nozzle. Air mingled in any way with the water will cause the ball to be thrown out.—ED.]

Destructive Collision of Tandem Bicycle and Carriage.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 3 you speak of the striking force of a wheelman at ten feet per second. I will give you something to think about. Three young men left here on the evening of September 7, to ride to Aurora, about twenty miles distant. Two rode a Rambler tandem, one a Fowler wheel; all three are expert long distance riders. When nearing Aurora, they reached the top of a sharp decline, and the temptation to race was too strong, and away they went. Coming from the other direction was a light wagon, containing a woman and two men, the wagon drawn by one horse; all reached the bottom of this hill at the same time—the horse at a slow trot, the boys at thirty miles per hour (and all the argument you could make will not make them come down a single mile).

The tandem struck the wagon somewhere about the left front wheel, none can tell how. Result, wagon wheel turned inside out, axle bent, shafts torn off and one man thrown out on his face. William Hill, first rider, thrown straight ahead about 30 feet, badly bruised and left leg injured, though able to be about on the 12th. Clare Phelps, second rider, thrown about the same distance as Hill, but at an angle of about 70°, using a right angle to the road as a base, bruised about the head and face, otherwise O K the next day. The wheel or tandem about 30° and in the ditch, the front wheel smashed, fork bent short back against the frame and the frame bent between the rear handle post and the front seat post in such a way as to force the front seat over the top of the rear handles; the seat was raised as high as it would go, for Hill is tall and the handle bars were low.

Hill's weight, 150 pounds; Phelps', 137 pounds; tandem, 48 pounds. These young men are used to the cyclometer and timing. Mr. Jarred, the other wheelman, has made his 2½ minutes time on country roads very often, and declares he never rode so fast in his life, and I believe him. A. A. WILSON.

Sandwich, Ill.

Note on Helium and Argon.

BY PROF. H. KAYSER, OF BONN.

Hitherto helium has been found only in a few minerals, and we do not know as yet in what state it exists there. It may therefore be interesting that I have found it in a free state in nature. Some time ago I received information that in the springs of Wildbad, in the Black Forest, bubbles of gas rise which—according to an old analysis of Fehling—contain about 96 per cent of nitrogen. As in all such cases it is possible that considerable quantities of argon may be found, I submitted the gas to analysis.

About 430 c. c. were mixed with oxygen, and sparks were caused to strike through it in presence of potassa lye. The excess of oxygen was then removed by means of potassium pyrogallate. After desiccation there remained 9 c. c., which were filled into Geissler tubes for a spectroscopic examination of the gas. It showed the lines of argon and helium, the latter not in a small quantity, as its lines appeared very bright and could be readily photographed. Runge and Paschen have found that the gas evolved from cleveite and broggerite is a mixture of two substances, one of which, helium, is most highly represented in the visible spectrum by the yellow line, D_3, while the other, not as yet named, is represented by the green line, $\lambda = 501{\cdot}6\ \mu\mu$. Both these elements are also represented in the Wildbad gas, though it seems to me that the second element is here in a smaller proportion than in broggerite, as the green line is relatively feebler.

In this result it seems to me especially interesting that thus for the first time a place has been discovered where the two gases included under the name "helium" are liberated and stream out into the atmosphere. Hence free helium must be found in the air along with argon. In fact, I have found in Geissler tubes which I had personally filled with the purest argon possible—and that at a time when I had not yet worked with helium, so that no admixture with it could have occurred in my laboratory—on direct comparison with helium tubes the presence of D_3 in the argon spectrum; and I have obtained photographically the strong lines at $388{\cdot}9\ \mu\mu$. The lines are certainly very faint, but I consider the presence of helium in the air of Bonn as beyond any doubt. Whether this presence of gases in the springs of Wildbad has any connection with their hygienic efficacy, and whether the gases occur in similar springs, the future must show.—Chem. News.

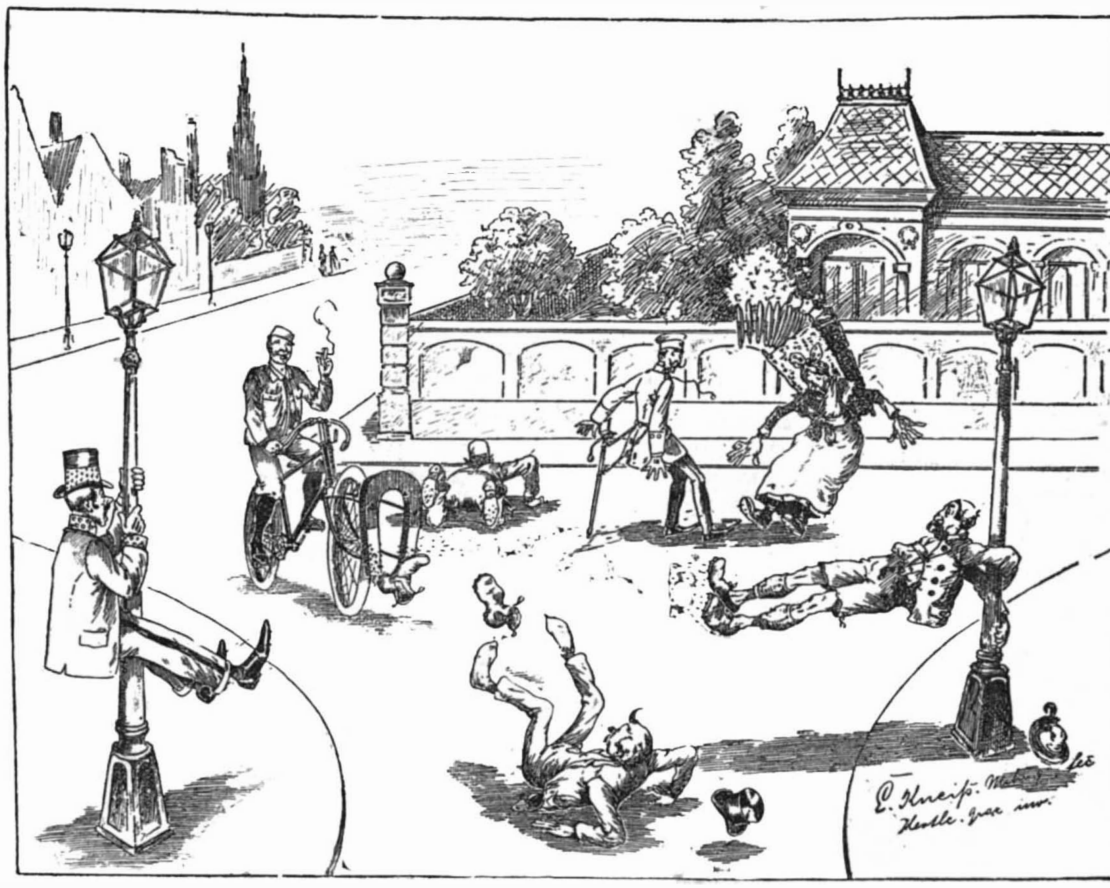
Students as Conductors in Philadelphia.

The Electric Engineer says that "during the past summer between 30 and 40 students of Jefferson Medical College, the Philadelphia College of Dentistry, the University of Pennsylvania and other colleges in this city obtained employment as conductors on the cars of the People's Traction System of Philadelphia. All of the young men came from outside the city, and were working their way through college. The last of them handed in their resignations last week, which the company accepted with regret, for the young men had proved to be the best conductors in its employ. An official of the company said the students were thoroughly honest, intelligent and polite, and as their desire was to earn as much money during the summer as possible, they were always willing to work extra hours and take out special cars. They lived economically and have probably saved something like $130 each, which will go a good way toward paying their college expenses next winter. One of the students has almost concluded not to go back to college, he likes railroading so well, and is still in the employ of the company."

THE MAGNETIC BICYCLE.

In some parts of the country there are malicious persons who throw tacks in the roadway to annoy bicycle riders by perforating the pneumatic tires. To meet this difficulty it has been proposed to attach a magnet in front of the forward wheel, with the object of picking up the tacks as the machine rolls along.

A caricaturist in one of the comic papers has made use of this idea in the accompanying sketch. Here the cyclist is represented as carrying such a powerful magnet that it not only picks up tacks, but even draws out the nails from the shoes of passers-by.



THE MAGNETIC BICYCLE.

Obstinate Thumping.

Sometimes an engine which usually runs well develops an obstinate pound or thump, which persists in spite of all the doctoring that can be done to the machine. In vain the engineer will go from the wrist pin to the crosshead, and from eccentric to bearing. Even the flywheel and the manner in which it is keyed upon the shaft will be investigated, to see if the thump is located therein. After all these things have been tried in vain, just give the engine a trifle more compression and note the result. Probably it will cure or make it worse. In the latter case change the valve again and give a little less compression than there was before. In nineteen cases out of twenty, says the Safety Valve, the change in compression will do the business. The philosophy of the business is this: The compression is too little or too great to allow the engine to run smoothly over the center; and at that point the piston gives a "yank," which causes wrist pin and connection and sometimes the main bearing to vibrate to the extent of the lost motion, forming the thump or pound, which is so objectionable to the good engine runner.

Should Your Boy Go to College?

Is a college course the best training for a boy designed for a business career? Upon this important question good judges differ. The editor of Munsey's, believing that those entitled to discuss this question with authority are rather the practical men of action than the theorists of educational science, has collected and presented the views of some of New York's leaders of affairs on this subject. In his introductory remarks the editor says:

"It might perhaps be thought that in the trial of such a cause each juror's verdict would depend upon his own personal history; that the college alumni would support the honor of their alma mater by voting for an academic training, while those who stepped directly from the school to the shop or office would advise others to seek business success by the pathway they themselves followed. This is, however, by no means invariably the case. There are university graduates—men who made good use of their time in the classrooms, and who went on to honorable places in the world—who question, nevertheless, whether those four formative years might not possibly have been spent to still better advantage. And on the other hand many if not most of those who have gained success without a college course look back upon their early days with a regretful sense of having missed something that would have helped and benefited them all through life; of having entered the arena without a weapon which nothing can entirely replace, even though they win the battle with the arms at their command."

Mayor Strong thinks that while a college education is a good thing to have, it is far from being indispensable to the business man. He says that if he had to choose between two applicants for a position, the one a college-bred man and the other a smart young fellow with only a common school education, he should engage the first, if the post in view would warrant it, and provided the college man displayed an equal capacity for work. If the other applicant was found to be more active, more willing, he would prefer him. Mayor Strong concludes by saying:

"A college education requires the investment of a small capital and the expenditure of several years of study. The boy of natural talent, who enters business life when he leaves the public schools, begins to earn money at once; but it does not follow that the college man's time and money have been wasted. His increased broadness of vision, the greater extent of resources at his command, will equip him to contend with the exigences of life, and to grasp the business problems that will confront him, with a surer hand, a clearer head, and more ready determination than his brother. The latter's advance in his chosen field will be steady, the result of unceasing labor. The college-bred man will gallop gracefully to the front, while the other's gait is slow and plodding, formed in the painful school of experience."

Similar ground is taken by Hon. Roswell P. Flower, who says that if he had a dozen boys, he would not send all of them to college, but would carefully select from the number those he judged to be best fitted for higher education, and the rest would have to get along as best they could with elementary knowledge. He had to make his own way thus insufficiently equipped, and while he is quite contented with his fate, he cannot help wishing sometimes that in his youth he had had better opportunity for developing his natural ability. Mr. Flower invites a glance at the careers of some of America's great intellectual leaders of the past who had no college education, such as Clay, Douglas, and Lincoln. He says:

"I think a college education the greatest boon that can fall to the lot of a boy endowed with a clever and active mind and a wholesome thirst for knowledge. However humble a man's station in life, knowledge will enrich him in the long run, one way or another. At the same time a university training is not essential to success in business life. Moreover, I should hesitate to advise a parent to send even the brightest boy to college if I was not quite sure that he could withstand the temptations sure to be offered to him there. There is too much luxury about our present-day college life. . . . Very few of the business men and politicians of the older generation were college-bred; the majority of those who are leaders in the commerce and industry of to-day, too, have achieved success upon a basis of a common school education; but the desirability of a university course is becoming more and more apparent as the struggle of life sharpens. Nothing will more thoroughly fit a boy for the battle before him than natural talent developed by a college education, and backed up by frugal habits."

One of the most conspicuous disbelievers in the university for the training of a boy for a business life is the well known banker, Henry Clews, who is reported as saying:

"Think of a man going into business with three-fourths of his brain cells filled with classical knowledge, dead languages, and high sounding but unpractical ideas!

"I have been severely criticised for saying that I would not have a college-bred man in my office. Here is my reason: To become a successful merchant, banker, or broker, one must begin young. Most college boys, when ready to enter an office, are over twenty years of age. I have a son at college—a six footer, in his twenty-first year. Can I ask him to undergo the training I deem necessary for every business man? Would he be willing to commence at the foot of the ladder, with boys of sixteen, and on a salary of $150 per year? Why, that youth not only knows more, in every branch of knowledge, than all the office boys and clerks in this office; he knows more than his father, too.

"A collegian cannot, or perhaps will not, humble himself sufficiently to learn the rudiments of the business man's vocation. He rebels against the discipline necessarily imposed upon a subordinate. He has been used to regard himself as a brilliant young gentleman for several years; can you blame him for objecting to sit on the same bench with errand boys? And has he enough practical knowledge to deserve a place behind the desk? In my opinion the average graduate does not even know enough of arithmetic and of caligraphy to earn, upon his arrival in an office, a salary of five dollars a week. My legible hand secured for me the first good position I ever held; the average college graduate writes a fearful scrawl, and is proud of it. I understand that none of our universities employs a teacher of caligraphy. This is a sad defect, of which the collegian does not become aware, as a rule, until it is too late to remedy the evil.

"I have practically tested the problem whether a college education is desirable for a business man. Years ago I employed several college men, one after another; none of them succeeded in benefiting either my business or himself. So I got rid of them. Of the boys who came to me equipped with nothing beyond a common school education, a sound mind, and an ambition to work, dozens are now independent business men, while as many hold responsible positions with large firms."

A more moderate view is expressed by a member of the famous Seligman fraternity, who says that in his business he prefers men who have received a college education, but does not make employment conditional upon that fact. Although college alumni are comparatively scarce among the business men of the present generation, he believes that the next generation will abound with them, for in every walk of life the necessity of higher education is becoming more and more apparent. He thinks that while a man of sound mind and good habits will come to the front, whether he is college-bred or not, with equal gifts and with the same application the collegian will outstrip him in the race.

The article closes with the views of Mr. Chauncey M. Depew, from which we quote:

"While the world gives on its material side such examples of success as Commodore Vanderbilt and such instances of wise statesmanship and service to his country as Abraham Lincoln, we must remember that in the affairs of life no comparisons can be made with the phenomenally gifted who are endowed by the Almighty from their birth with powers far beyond the equipment of their fellows. With the business man who must be more than his vocation, the artisan larger than his trade, and the farmer more learned than in the traditions of his fathers, it is the trained intellect disciplined by higher education which alone has any certainty of success.

"This is not a modern thought, a new-fangled idea. American independence, and the founding of our

nation upon constitutional lines, embodying the experience and the lessons of the ages, was the work of the graduates of the colonial colleges. Harvard, Yale, and Princeton, Columbia, and William and Mary were the architects of the Declaration of Independence, of the Constitution of the United States, of the union of the States, and of the incomparable system of executive, legislative, and judicial independence and interdependence which have survived so successfully a century of extraordinary trial and unprecedented development. Samuel Adams, in his commencement thesis at Harvard, struck the keynote of colonial resistance. John Morin Scott brought from Yale to New York the lessons which prepared that rich and prosperous colony for the sacrifices of the Rebellion. Alexander Hamilton, a student at Columbia, though only seventeen years of age, educated the popular mind to the necessity of the struggle; while the pen of Jefferson, of William and Mary, wrote that immortal document which lives and will live forever as the most complete charter of liberty.

"The best proof of the value of a college education in all the pursuits of life is to be found in the eminent success of those who have enjoyed it in the higher walks of the professions, of statesmanship, of business."—The Literary Digest.

Power Required for Electric Traction.

In an article in the Sibley Journal of Engineering, Mr. James Lyman gives the results of a number of tests made in different American cities of the power required for electric traction. At Rochester, where the first of Mr. Lyman's records were obtained, there are about 20 miles of track which was in good condition at the time of the test. The number of cars on the road was 40, each weighing about 8 tons and provided with a 15 horse power geared motor. In general the road was level, but in the heart of the town there were some gradients of from 3 to 4·7 per cent. Moving on the level the necessary tractive power averaged 38 lb. per ton of car, and for the whole run over the four principal routes at 6·5 miles per hour, the average horse power was 1·4 per car, and the maximum 6 horse power, this latter being used only momentarily. At Buffalo the same average power was required, but the maximum was 6·6 horse power. In a large Western city a car with the axles coupled direct to the motor, without the intervention of gearing, took 0·92 horse power per ton on the average with a maximum of 4·7 horse power. In wet weather the tractive power required is reduced, the rain acting as a lubricant. Wetting of the rails round curves is particularly effective, the requisite tractive power being thereby reduced by one-third. Comparative experiments made at Ithaca, N. Y., showed that on gradients the tractive force required exceeds that on the level by more than the theoretical amount.

The Dismal Swamp and its Occupants.

"I have just returned from a visit to the Dismal Swamp," said Dr. A. K. Fisher, ornithologist of the Department of Agriculture, in Washington, the other day. "It is a strange region, full of oddities that are not to be found elsewhere. The purpose of my expedition was to investigate the fauna of the locality, and of rare mammals and birds I secured quite a number. Snakes are abundant and are alleged by the natives to be venomous, but all that I saw were harmless. When I picked up a good-sized one from a log and held him by the neck, the negro who was paddling for me shuddered so he nearly upset the boat.

"I found about fifty species of birds breeding in the swamp. One of them was Swainson's warbler, which is very rare. I trapped several species of small mice—rice mice, field mice, golden mice and lemming mice. The lemming mouse is hard to catch, because it will not take any sort of bait; the only way to capture it is to set a trap in its runway. I set my traps in dry places out of water. Among other things I got two rare shrews.

"There are plenty of cattle in the swamp—small, dark and very wild. They are the progeny of animals that have strayed from domesticated herds. Hunters stalk and shoot them like deer. Bears are numerous. In the autumn they feed greedily on the fruit of the sour gum. Wildcats, opossums and raccoons are not scarce, while squirrels are remarkably abundant. The squirrels have discovered an easy way to get a living by going along the shores of Lake Drummond and picking up the nuts and berries which have fallen into the water and drifted in windrows. They trot along the logs and fish them out with their paws. Deer are common but hard to get. In the fall hunters run them into the lake and catch them with dogs.

"There is fine fishing in Lake Drummond, which contains plenty of perch, black bass, two kinds of pickerel, three species of sunfish and other panfish. There is no dry ground in the swamp, and one sinks at every step to his knees in mud. The cane which forms brakes all through the South is abundant. Together with a varied undergrowth, it is tangled with vines that run up into the trees, so that half a mile an hour is a good rate of progress. One must carry a knife to cut the vines, walking being further impeded by the cat brier, whose thorns catch in the clothing and hold on like hooks.

"The boats used in the Dismal Swamp are all dugouts, made from cypress logs, twelve feet long and very narrow. To shape such a craft properly is a nice piece of work. The novice who steps into one of these boats is apt to go out on the other side, but the native stands up and paddles with security. The water is darker than amber and excellent to drink; it is said to be a sure cure for malaria. There are no malarial diseases in the swamp. The swamp is full of magnolias, from the size of bushes to trees sixty feet high.

"When I was there they were full of flowers. The cypress trees are cut for shingles. The best trees for the purpose are those which fell from twenty-five to fifty years ago, and are now covered with moss. The negroes wade in and cut off the moss and rotten bark. Then they cut up the log into shingles on the spot. The next best tree is one that is newly fallen, and the third quality is the tree that has to be felled."—Philadelphia Telegraph.

ACCORDING to Dr. Krüger, of Charlottenburg, Germany, a mixture of equal volumes of acetylene and carbonic acid gas can be used with all ordinary gas burners and gives an excellent light, and which is practically entirely without the explosive qualities possessed by the pure acetylene gas. Compressed acetylene and carbonic acid gas can be obtained commercially in Germany, so that gas illumination can be obtained independent of gas companies' pipes.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR FENDER.—John F. Girtler, Brooklyn, N. Y. This fender is conveniently attachable to any car, and adapted to be folded up when not in use. The fender frame is detachably connected by hooks with the dashboard, and on its lower end is pivoted a forwardly and downwardly extending platform, held in position by chains, and beneath which are track rollers, there being on the front end of the platform a tripping plate connected by springs with a guard rail, which is swung into position to hold a person in the path of the car safely on the fender, when struck by the tripping plate.

BUFFER AND DRAUGHT DEVICE FOR CARS.—George E. Shuey, Lawtey, Fla. This improvement is designed to relieve car frames from pulling shocks or strains, or the impact of one coupling on another. A yoke is transversely secured to each coupling, at each side of which, on the car frame, are guide rods carrying springs pressed on by a follower plate, draught rods secured to the yokes passing loosely through the follower plates.

Electrical.

THERMOMETRIC CIRCUIT CLOSER.—Richard Pearson, London, England. According to this improvement, a thermometer mounted on a horizontal axis is so balanced as to be caused to oscillate under the displacement of the center of gravity by the expansion and contraction of the thermometric fluid, thus automatically completing or breaking an electric circuit for any purpose. A novel form of thermometer is employed, in which the mercury serves only to render visible the expansion and contraction of a lighter fluid, and also as a means of producing the oscillation of the instrument, the balance of which may be readily adjusted so that it will oscillate at any given temperature.

Mechanical.

NUMBERING MACHINE. — Thomas F. Geary and William E. Bracewell, Brooklyn, N. Y. This improvement is more especially designed for use in rotary web-perfecting printing presses and other machines, to be inserted in the type or printing plate cylinder, to effect numbering with each impression. The numbering wheels, meshing with gear wheels, are mounted in a frame to be set in the plate, the shafts of the wheels passing through a slot in a spring-pressed slide carrying a pawl engaging one of the gear wheels, while a head is engaged by the impression cylinder to operate the slide.

ENGRAVING MACHINE.—Jere G. Kingsbury, Bridgeport, Conn. This is a machine for cutting numbers in intaglio, or below the surface, upon a counting wheel, the wheel doing all the work of cutting and finishing with the service of but a single attendant. It has two shafts, one supporting a master wheel and the other a blank wheel, there being means for imparting rotary movement to one shaft and a compensating gearing between the two shafts, while a delineating arm having a tracing point engages the master wheel and a cutting tool engages the blank wheel.

Agricultural.

HAY LOADER.—Ole and William Swenson, Cresco, Iowa. In this implement an elevator is suspended from the axles of drive wheels, and provided with reciprocating feed arms operated from one of the drive wheels, the mounting of the elevator enabling a person standing upon the load to readily elevate the upper end of the elevator. At the rear of the elevator is a rake, and shields facilitate the grasping of the hay by hook teeth at the bottom of the elevator arms, two of these teeth on each arm delivering the hay from the rake to the elevator.

Miscellaneous.

BICYCLE WHEEL.—Gustave Le Blanc and Leander Johnson, Mead, Neb. The tire of this wheel is of solid rubber, oval in cross section, fitting in a rim of similar outer surface and having side flanges, and the rim is connected to the spokes by means of bow springs, the spokes crossing each other, and each spoke being connected with the spring by a nipple or nut, by which the springs may be placed under more or less tension. By this means a maximum degree of resiliency is given to the wheel without employing a pneumatic tire, and the wheel is made very strong.

BLASTING POWDER. — Benjamin C. Pettingell, Victoria, Canada. This is designed to be a cheap powder of great strength, which will emit no flame when exploded and will make less than half the smoke of the black powder in common use. It is manufactured by first immersing powdered carbon alone in a solution of niter, drying, and afterward adding and mechanically mixing therewith sulphur and wood pulp.

EVAPORATING LIQUIDS.—Leon F. Haubtman, New Orleans, La. An apparatus for evaporating water and saccharine solutions or other liquids has been devised by this inventor, in which superheated air is caused to absorb the moisture contained in the liquid to be concentrated by causing the hot air, driven by a blower, to come in direct contact with a flowing liquid, the liquid flowing in an opposite direction to the movement of the air, and a current being created opposite to the current of the liquid.

FILLING CHOCOLATE DIPPERS.—Cyprien Gousset, New York City. This inventor has devised an apparatus to facilitate the manufacture of chocolate cream drops, consisting of a table provided with projections, each adapted to support a cream drop in position to be passed into a pocket in the chocolate dipper, a perforated guide board causing the cream drops to take position upon the projections.

AFFIXING STAMPS.—William L. Dinsmoor, Portland, Oregon. This inventor has devised a machine, to be operated by one hand, for applying stamps to envelopes and other packages to be mailed, the machine holding a large number of stamps, which are fed out one by one, moistened and applied. The machine has a spring-controlled plunger, beneath which is a sliding table, a stamp-feeding device being operated simultaneously with the upward movement of the plunger, while a moistening device independent of the plunger is operated from the table. It is said that the machine will stamp 45 letters per minute, and it may also be used for moistening envelopes.

MUSIC LEAF TURNER. — Daniel T. Fox, Mount Pleasant, Pa. The body of this device supports a series of pivoted swinging sheet-carrying arms, finger-operated throw devices being arranged when pressed upon to throw the carrying arms. The throw devices include lever members to impart a speed movement to the arms, giving them increased speed as they near the end of their movement. The turning action is effected in a gentle but positive manner, without danger of tearing the sheets.

CLOTHES DRIER.—William M. Rowley, Cuba, N. Y. A rack of very simple and inexpensive construction has been devised by this inventor, capable of being attached to any convenient support, and which when in use will be firmly braced, the arms adapted to support the clothes being held adjustably in a horizontal position. When the rack is not in use it may be folded downward compactly parallel with its support and be practically out of the way.

BED CLOTHES HOLDER.—Russell T. Joy, Tacoma, Washington. For holding bed clothes on a bed, this inventor has devised a holder, the gripping jaws of which will not injure the most delicate quilt or other bed covering, a locking device setting the jaws at various distances apart or substantially close together to effectually hold the thickest or the thinnest bed clothes.

LAWN SPRINKLER.—Russell T. Joy, Tacoma, Washington. This is a sprinkler of inexpensive construction, comprising virtually but two parts, and arranged for the easy regulation of the spray. The casing has an arched bottom, which will not injure the surface of the sod, and has an inlet opening at one side to which the hose is coupled, while the separating or sprinkling cone is screwed adjustably to place, to form a fine spray or to deliver the water more in sheet form.

CULINARY UTENSIL.—Edward O. Rabon, Philadelphia, Pa. A utensil for pouring batter on a griddle in making batter cakes has been provided by this inventor. It comprises a vessel with an outlet at its lower part controlled by a valve actuated by a lever adjacent to the handle, whereby the device is operated by a minimum movement of the hand and is made at once simple and convenient.

NAPKIN HOLDER.—Alexander A. Vernon, Owen Sound, Canada. This holder permits the wearer to readily apply it on a collar or neckband, and consists principally of a back plate having on its upper end rearwardly extending hooks, the plate having at its lower ends a doubled up clamping band to securely hold the napkin in position.

DESIGN FOR FAN RACK.—Alexander H. Davison, Athens, Ga. This device comprises a vertical column or post with circular base, there being on the post star-like figures with serrated or toothed edges.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

SEPTEMBER, 1895.—(No. 119.)

TABLE OF CONTENTS.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6625) R. M. J. says: Can you give the formula for a cement for cloth? A. Use thin sheet gutta percha, which can be purchased of the manufacturers, especially for tailors' use. Place a piece of the tissue between the layers of cloth to be cemented and press with a hot iron. This causes the cloth to firmly ad here on account of the melting of the gutta percha.

(6626) E. E. R.—The compound leaf sent by Mr. E. E. Roberts, of Winthrop Harbor, Illinois, is that of the Kentucky coffee tree (Gymnocladus canadensis). It is a slender tree with rather large bipinnate leaves, not uncommon in the We and South and closely related to the uncommon honey locust. The generic name refers to the stout branches destitute of spray or thorns. It belongs to the pulse family and the pod is woody, pulpy within, with from 6 to 8 large compressed bony seeds.

(6627) C. W. S. asks: 1. In gasoline engines is gasoline vaporized or atomized when injected into the cylinder ready to be fired? A. Gasoline vaporizes at ordinary temperatures with a moderate evaporating surface with a pressure of from one to two inches of water, which is sufficient to cause the vapor to flow through a pipe to the cylinder, where it is drawn in with the proper proportion of air by the movement of the piston. 2. Is compressed air used to atomize the gasoline, if that is the form it is injected into the cylinder? A. The gasoline is not atomized by compression. This method is not reliable. 3. What test gasoline is generally used? A. Gasoline of 0·65 to 0·70 specific gravity (water 1) is used. 4. For 10 hours' work, one horse power actual, how much gasoline is used and its cost per gallon? A. About one pint of gasoline per brake horse power per hour, at a cost of about 15 cents per gallon. 5. What quantity of gasoline is generally forced into the firing chamber at one time for a one horse power? A. One part gasoline vapor to 10 parts air is the best proportion, drawn in by the piston to the extent of from ¼ to ⅓ of the stroke. 6. How or by what principle is the inflamed gasoline prevented from passing from piston chamber back into the supply pipe? A. By a sliding port valve which controls the inlet and exhaust. 7. In building a motor to propel a carriage, what would be the weight of two cylinders of two horse power each? This is to include only the piston rod, etc., and frame of sufficient strength to support them. A. The gasoline motor must have a fly wheel and for 2 horse power should weigh 300 pounds. 8. Would four metal wheels the size of ordinary carriage wheels and constructed similar to bicycle wheels, only of slightly heavier material, be sufficient to sustain combined weight of frame, cylinders, and four to six adults? A. Wheels should be heavier than ordinary carriage wheels. A complete motor carriage for six persons would weigh 1400 pounds. 9. Are pneumatic tires of sufficient strength to withstand such a pressure? A. Pneumatic tires will not stand the pressure. Solid rubber tires are used. 10. What would be the approximate cost of such a motor, also of frame and such wheels as described? A. The cost of such carriages as made is about $1,200. The motive power would cost about $400. 11 Would the cylinders become heated to such an extent when vehicle was in motion as to require cooling, and what is the general method of reducing this increased temperature? A. The cylinder requires a water jacket and a self-circulating water-cooling tank arranged on the carriage. See illustrated description of automobile carriages in SCIENTIFIC AMERICAN SUPPLEMENT, No. 979, and SCIENTIFIC AMERICAN, July 20, 1895.

(6628) E. W. C. asks how to etch on steel for tool marking. A. For etching brands and marks on polished steel surfaces, such as saws, knife blades, and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design made so that the letters and figure that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use resin, lard oil, turpentine and lampblack. To ¼ pound of resin put 1 teaspoonful lard oil; melt, and stir in a tablespoonful of lampblack; thoroughly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp in the same manner as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required, then pour the acid off. Rinse the surface with clean water; take off the putty border, and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts water by measure. If the effervescence seems too active, add more water.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 24, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising lamp, A. C. Wright ... 546,346
Air brake, A. L. Wheeler ... 546,835
Air heating apparatus, H. C. Sergeant ... 546,866
Alloy, metallic, W. H. Kemler ... 546,780
Amalgamator, G. M. Urie ... 546,749
Animal trap, J. A. Dietz ... 546,918
Animal trap, E. Hoover ... 546,886
Annunciators, electrical indicating system for, W. F. Banks ... 546,874
Awning operating mechanism, T. J. Daniels ... 546,730
Bag. See Mail bag. Paper bag.
Bags, machine for inserting shirring strings into, Sherman & McArdle ... 546,940
Barley fork, N. Leonard ... 546,740
Barrel attachment, W. L. Rushton ... 546,680
Bath, F. Ponce ... 546,937
Bathtub and trunk, combined, E. Sandow ... 546,711
Bearing, ball, O. C. Knipe ... 546,818
Belt and skirt attachment, M. Freund ... 546,920
Berry picking machine, G. H. Hasey ... 546,777
Bicycle, W. Johnson ... 546,668
Bicycle driving gear, Lippy & Finfrock ... 546,703
Binder, folio, P. D. Fenn ... 546,811
Binder for newspapers or the like, J. W. Wood ... 546,910
Blacking, shoe, J. B. Bernard ... 546,876
Blind, awning, S. H. Davis ... 546,759
Boiler. See Range boiler. Steam boiler. Water tube boiler.
Boiler furnace, W. Brand ... 546,772
Boiler handholes, closure for, J. D. Smith ... 546,789
Boiler tubes, apparatus for removing incrustations, etc., from, H. Baschy ... 546,804
Bottle stopper, G. C. Vollmer ... 546,720
Bottles, etc., machine for manufacturing, P. B. Maussier ... 546,931
Bowl or box for household purposes, J. McConnell ... 546,706
Box. See Miter box. Paper box.
Box fastener, S. C. Cary ... 546,839
Box setting machine, J. B. Chace ... 546,841
Brake. See Air brake. Car brake.
Brake shoe connection, J. J. Kinzer, Jr. ... 546,701
Brick kiln, W. P. Grath ... 546,776
Brick kiln, T. L. Myers ... 546,934
Bridle, A. M. Pendleton ... 546,785
Bridle blinder, M. A. Wilson ... 546,690
Bronze tincture, manufacture of, H. Schlenk ... 546,963
Bucket, sap, C. Bouton ... 546,648
Burner. See Gas burner.
Cable buffer, L. W. Sheldon ... 546,788
Can opener, J. Gilbert ... 546,813
Cane hook, sugar, J. T. Moore ... 546,741
Car brake, automatic, C. Brandau ... 546,808
Car coupling, W. Kelso ... 546,779
Car coupling, W. McConway et al ... 546,783
Car coupling, H. Parker, Sr., et al ... 546,864
Car fender, E. J. McLaughlin ... 546,962
Car fender, W. E. Woodbridge ... 546,797, 546,798
Car spring, A. G. Spencer ... 546,831
Car windows, pneumatic device for raising or lowering, Holbrook & Beals, Jr. ... 546,854
Cars from burglars, apparatus for protecting, F. H. Karnatz ... 546,890
Carburetor, R. B. Hain ... 546,815
Carpet, etc., beater for, G. B. Younkin ... 546,870
Carriage tops, concealed joint for, H. C. Martell ... 546,705
Cartridge case, J. Pinfold ... 546,936
Case. See Cartridge case. Paper case.
Casting journal boxes, core and chill for, S. Watt 546,948
Casting mould, screw, Dyson & Williamson ... 546,879
Cementation compound, W. J. Miles, Jr. ... 546,933
Chain link, J. C. Schmidt ... 546,713
Check, draft, etc., bank, I. Randall ... 546,825
Chuck, drill, J. T. Fink ... 546,761
Cigarette machine, A. Moonelis ... 546,822 to 546,824
Cleaner. See Cuspidor cleaner. Dust collector cleaner.
Clock, A. M. Lane ... 546,819
Clock winding mechanism, A. M. Lane ... 546,782
Cloth cutting machine, J. Philippsohn ... 546,746
Cloth stretching machine, D. Gessner ... 546,762
Clothes line fastener, C. Benesh ... 546,754
Coal, apparatus for reloading, F. H. Symons ... 546,790
Coffee or tea pot, W. P. Wilson ... 546,967
Columns, construction of Z-bar, F. H. Kindl ... 546,781
Compasses and glass cutter, combination, J. Kohler ... 546,669
Compressor, hydraulic, H. Reisel ... 546,938
Condenser, surface, E. Theisen ... 546,946
Conduit coupling, G. W. Davis ... 546,953
Conveyer for coal, etc., E. D. Lukis ... 546,671
Cooking vessel, steam, C. T. Owens ... 546,678
Copy holder, Foxall & Storms ... 546,734
Cork extractor, M. & M. Redlinger, Jr. ... 546,747
Corks from bottles, apparatus for drawing, Read & Hurst ... 546,902
Coupling. See Car coupling. Conduit coupling. Pipe coupling.
Crank, reciprocating motion, H. J. F. Guillou ... 546,847
Cucumber picker, G. Botkin ... 546,913
Curling iron, H. B. Stout ... 546,833
Current rectilinear motor, continuous, C. E. Woods ... 546,691
Curtain fixture, W. K. McCoy ... 546,743
Curtain support, J. H. Stevenson ... 546,832
Cuspidor cleaner, A. Larson ... 546,893
Damping textile fabrics, apparatus for, W. Mather ... 546,930
Display apparatus, F. W. G. Boettcher ... 546,912
Distilling liquid hydrocarbons, apparatus for, P. Dvorkovitz ... 546,697
Distributing apparatus, H. G. Butler ... 546,692
Dolls, etc., joint for, Verpillier & Graves ... 546,791
Door hanger, J. W. Conchar ... 546,729
Drawings, apparatus for holding, W. H. Barnes ... 546,647
Dredging bucket, E. J. Fader ... 546,698
Drier. See Mechanical drier.
Driving mechanism, frictional, C. H. Brown ... 546,650
Dust collector cleaner, Stephens & Parsneau ... 546,944
Eccentric gear, W. R. Brown ... 546,757
Electric generator attachment, G. W. Pickett ... 546,901
Electric light display system, J. E. Woodbridge ... 546,799
Electric meter, J. A. Dejardin ... 546,917
Electric time switch, J. F. McLaughlin ... 546,674
Electric switch, G. E. Linton ... 546,820, 546,821
Electric system, M. J. Wightman ... 546,724
Electrical or other instruments and apparatus, screening, Ayrton & Mather ... 546,802
Electrical system of motor regulation, M. J. Wightman ... 546,966
Engine. See Hydraulic engine. Rotary engine. Steam engine.
Engines, apparatus for recording the power of steam, W. G. & C. W. G. Little ... 546,897
Engines, vacuum dash pot for, R. H. Rice ... 546,976
Envelope, J. A. Eno ... 546,760
Envelope folding and embossing machine, combined, Tate & Brune ... 546,685
Extractor. See Cork extractor. Oil extractor.
Fastening device, S. C. Cary ... 546,838
Faucets, packing device for beer, J. Desserich ... 546,732
Feather pulling in fowls, device for prevention of, C. C. Schild ... 546,905
Fender. See Car fender. Plow fender.
Fertilizers, method of and apparatus for preparing, W. A. Shepard ... 546,716
Fiber curling apparatus, Flower & Rhoades ... 546,660
Fiber, machine for untwisting and picking ropes of, S. A. Flower ... 546,661
Filamentary hood or grating, W. L. Voelker ... 546,792
Filter, O. H. Jewell ... 546,738
Finishing roll, I. Vaughn ... 546,868
Fireproof blind or partition, rolling, W. R. Kinnear ... 546,858
Fireproof shutter, W. R. Kinnear ... 546,857
Fish tank or aquarium, G. P. A. Gunther ... 546,882, 546,883
Float, O. A. Benoit ... 546,771
Flour, etc., unifying, K. Smith ... 546,830
Flower stand, W. Nafe ... 546,745
Fork. See Barley fork.
Frequency changer, E. J. Berg ... 546,806
Fruit picker, T. P. Williams ... 546,950
Furnace. See Boiler furnace. Hot air furnace.
Furnace grate, L. Benier ... 546,875
Furniture joint, W. C. Hood ... 546,816, 546,817
Fuse connector, A. Gartner ... 546,957
Game indicator, J. S. Larzelere ... 546,959
Garment supporter, A. S. Grimm ... 546,735
Gas burner, E. S. Hoyt ... 546,765
Gas burner, safety, B. Smith ... 546,941
Gas from natural gas wells, etc., apparatus for withdrawing, Danforth & Sencenbaugh ... 546,952
Gas meter bellows, J. D. Viney ... 546,947
Gas, process of and apparatus for manufacture of, W. A. Koneman ... 546,702
Gate. See Railway gate.
Gate, V. Benz ... 546,805
Gate, J. H. Jackson ... 546,667
Gate, E. F. Shellaberger ... 546,829
Generator. See Electric generator. Steam generator.
Governor, G. J. Altham ... 546,872
Governor, steam engine, H. C. Clay ... 546,728
Grab for excavating and elevating clay, coal, etc., G. J. Hone ... 546,885
Grinding mill, J. C. Woodcock ... 546,869
Hair curler, H. Neumann ... 546,898
Harmonica, M. Doerfel ... 546,733
Hasp lock, J. A. Crawford ... 546,916
Hat pin holder, T. J. Golden ... 546,881
Hay carrier track, W. & R. B. Louden ... 546,975
Hay loader, S. T. Russell ... 546,681
Hay rake, horse, G. L. Weaver ... 546,980
Heater. See Locomotive feed heater.
Heating and ventilating rooms or houses, J. Cinnamon ... 546,842
Heating apparatus, N. E. Frost ... 546,971
Hinge, detachable, O. H. P. G. Spencer ... 546,909
Hinge, lock, W. R. Kinnear ... 546,856
Hitching device, H. B. Murlless ... 546,742
Hook. See Cane hook. Pail hook.
Horses, device for stopping runaway, J. G. Casey 546,694
Horses, device for stopping runaway, W. E. Vose 546,794
Horses, means for analytically recording gait of, T. J. Kean ... 546,700
Horseshoe creasing ring, J. Schwarting ... 546,787
Horseshoe nail cutter and clincher, H. M. Hoadley ... 546,665
Horseshoe, nailless, Camblos & Bittles ... 546,693
Hot air cabinet and screen, combined, C. M. Robinson ... 546,865
Hot air furnace, R. J. Schwab ... 546,714
Hot air furnace, D. B. Weightman ... 546,722
Hydraulic engine, F. Starr ... 546,943
Ice cream freezer and churn, combined, W. R. Thatcher ... 546,945
Igniting apparatus, P. Groebbels ... 546,923
Indicator. See Game indicator.
Insulating support for electric wires, J. N. Bulkley ... 546,837
Jack. See Lifting jack. Wagon jack.
Jetty, B. N. Bryant ... 546,758
Joint. See Furniture joint. Pipe joint.
Journal box, self-lubricating, M. G. Keeran ... 546,958
Journal boxes, device for lubricating, F. Fehr ... 546,659
Journal for bicycles or other vehicles, C. Truman 546,719
Kiln. See Brick kiln. Limekiln.
Knife for rotary trimmers, A. S. Vose ... 546,750
Knob attachment, C. F. Doebler ... 546,970
Labeling machine, P. E. Loree ... 546,961
Lamp chimney holder, L. H. Leighton ... 546,861
Lamp, electric arc, R. Schefbauer ... 546,826 to 546,828
Lamp, electric arc, C. Weber et al ... 546,689
Lamps, means for varying light for incandescent electric, C. A. Hussey ... 546,666
Lifting jack, J. M. Lynn ... 546,704
Limekiln, S. W. McLoon ... 546,935
Lock. See Hasp lock.
Locomotive feed heater, J. P. Serve ... 546,683
Loom shuttle thread tension device, H. W. Owen 546,677
Loom temple, W. Hinchliffe ... 546,778
Loom warp stop motion, O. Smith ... 546,977
Mail bag, T. H. Gordon ... 546,763
Mail bag, J. Shilling, Jr. ... 546,717
Mail bag fastener, E. H. Walker ... 546,795
Marker for gardens, row, G. L. Carruthers ... 546,653
Mechanical drier, F. D. Cummer ... 546,655
Metal strips, rods, etc., machine for cutting, J. Bott ... 546,726
Meter. See Electric meter.
Mill. See Grinding mill.
Miter box, K. L. Hyller ... 546,887
Mould. See Casting mould.
Moulding apparatus, J. F. Hay ... 546,736
Motor. See Rotary disk motor.
Motor, G. B. Wiggins ... 546,723
Muffler, exhaust, R. B. Hain ... 546,814
Music leaf turner, W. E. Somers ... 546,908
Musical instruments, mouthpiece for metal, C. G. Schuster ... 546,939
Napkin holder, A. Dormitzer ... 546,658
Net, fly, W. Kootz ... 546,860
Nut wrench, axle, A. R. Yount ... 546,752
Oil extractor and drier, W. S. Pierce ... 546,708
Ores, treating zinc bearing, E. A. Ashcroft ... 546,873
Organ bellows tension evener, R. A. Gally ... 546,956
Organs, electromagnet for pipe, E. S. Votey ... 546,834
Oven, baker's, G. Blendinger et al ... 546,755
Padlock, permutation, S. Bozano ... 546,969
Pail hook, S. C. Cary ... 546,840
Paint, P. Inch ... 546,888
Paper bag, A. Herzing ... 546,853
Paper box, F. Knobeloch ... 546,767
Paper box, folding, J. H. Bitterlich ... 546,807
Paper case, toilet, S. Hughes ... 546,849
Pen, drawing, F. W. Lepper ... 546,850
Phases and rotary fields, production of displaced, C. S. Bradley ... 546,756
Photochromoscope and photochromoscope camera, F. E. Ives ... 546,889
Photograph stand, pillar, I. Werthen ... 546,751
Piano frame and bridge, D. L. Rice ... 546,709
Picker. See Cucumber picker. Fruit picker.
Pipe coupling, train, Bischoff & Baird ... 546,877
Pipe joint, M. Sexton ... 546,906
Pipes, etc., testing and flushing drain, W. Keith ... 546,766
Placket closer, E. Gumbinner ... 546,924
Planter and fertilizer distributer, combined, W. H. Baker ... 546,646
Plow corn planting attachment, C. D. Baird ... 546,753
Plow fender, J. T. Nuckolls ... 546,675
Plow, subsoil, P. Heintz ... 546,884
Plow sulky attachment, Duttera & Flickinger ... 546,919
Pneumatic dispatch system, O. Konigslow ... 546,859
Porous plates or electrodes, making, Johnson & Robertson ... 546,739
Port-hole stopper, J. Casey ... 546,914
Power and heat, system and apparatus for generating, accumulating, and distributing, C. C. Warren ... 546,796
Power transmitting mechanism, C. Bernhard ... 546,951
Press. See Printing press.
Printing press, F. C. Stockholm ... 546,718
Propeller, P. F. Schmidt ... 546,712
Pump, lift and force, E. Noppel ... 546,863
Rail chair and tie, combined, J. Albrecht ... 546,800
Railway, cable, C. I. Earll ... 546,955
Railway cattle guard, E. G. Emmert ... 546,775
Railway gate, J. W. Murray ... 546,979
Railway rails, clamp for welding, W. M. Brown ... 546,773
Railway rails to metal ties, device for attaching, Emrich & Rollins ... 546,810
Railway tie, J. D. McDowell ... 546,744
Railway with suspended vehicles, overhead, E. Langen ... 546,928
Rake. See Hay rake.
Range boiler, J. Hussey ... 546,737
Ratchet wrench, H. Markel ... 546,672
Registering mechanism, F. H. Richards ... 546,748
Registering of disbursements and receipts, apparatus for automatic, J. Frydmane ... 546,880
Rotary disk motor, L. Vojacek ... 546,688
Rotary engine, Kenney & Bullock ... 546,974
Rotary screen, J. J. Newman ... 546,899
Rowing device, bow, A. Smith ... 546,942
Sad iron, self-heating, J. M. Doehrer ... 546,656
Saddle, harness, L. J. & H. A. Varga ... 546,687
Sandwiches, machine for making, S. A. Gage ... 546,662
Sash fastener, A. E. Bray ... 546,649
Sash fastener, W. J. Neidl ... 546,784
Sash weight, W. E. Merrell ... 546,862
Saw, hand, D. R. Thomas ... 546,686
Sawmill set works, C. F. Coffin ... 546,654
Saw set and jointer, W. I. & R. C. Simmons ... 546,964
Sawing machine, J. Barnes ... 546,803
Scale, platform, F. F. Meyer ... 546,673
Scoop board, D. S. McGurthy ... 546,707
Scraping, chopping, and cultivating machine, combined, J. A. Alexander ... 546,801
Screen. See Rotary screen.
Screening apparatus, J. F. H. King ... 546,891
Sewing machine, Legg & Treacy ... 546,768
Sewing machine for lasting boots or shoes, W. C. Collyer ... 546,695
Sewing machine ruffler, A. Laubscher ... 546,670
Shade holder, curtain, Van Gilder & Wilson ... 546,867
Shutter slat operator, T. M. Fuller ... 546,845
Sifting apparatus, A. Behringer ... 546,911
Skate sharpening device, F. W. Lowe ... 546,929
Slate and scholar's companion, combined, B. B. Hartleb ... 546,848
Soap receptacle, pulverized, C. S. Stevenson ... 546,684
Sole, H. Mayer ... 545,932
Sole rounding and channeling machine, French & Meyer ... 546,852
Spinning, winding, and twisting machine spindle, M. Chapon ... 546,915
Spring. See Car spring.
Stamp, time, J. J. Busenbenz ... 546,651
Stamps, hand device for affixing postage, Martin & McFeat ... 546,769
Stand. See Flower stand. Photograph stand.
Steam boiler and coupling, E. S. Clark ... 546,809
Steam engine, J. C. Peache ... 546,900
Steam generator, J. J. Rohan ... 546,786
Steam trap, thermostatic, E. E. Gold ... 546,846
Stool, camp, H. Leovy ... 546,895
Stopper. See Bottle stopper. Port hole stopper.
Stove, heating, J. A. Kendall ... 546,926
Switch. See Electric switch. Electric time switch.
Tank. See Fish tank.
Telegraph and telephone system, combined district, Salisbury & Dean ... 546,904
Telegraphic vibrator, P. La Cour ... 546,892
Telephone, G. A. Tower et al ... 546,965
Telephone self-acting commutator, Berditschewsky dit Apostoloff & Freudenberg ... 546,725
Telephone system, W. W. Dean ... 546,731
Telephonic attachment L. J. Gerson ... 546,972
Telescope, binocular, E. Abbe ... 546,871
Telescopic joint, R. A. Kane ... 546,699
Tent support, C. W. Williams ... 546,978
Theatrical device for producing illusory effects, A. Lake ... 546,927
Thermocauter, J. E. Lee ... 546,894
Tie holder, collar, H. M. O'Reilly ... 546,676
Timber, compound for preserving, F. A. Lobert ... 546,960
Tire, pneumatic, C. Woolley ... 546,968
Tire upsetter, F. Ward ... 546,721
Tobacco leaf stemming machine, A. H. Cochrane 546,843
Trap. See Animal trap. Steam trap.
Trough. See Watering trough.
Truck, car, E. Cliff ... 546,774
Truss, A. Weil ... 546,949
Typewriter key, W. B. Lillard ... 546,896
Valve, G. W. Graffin ... 546,922
Valve, air brake, S. H. Heginbottom ... 546,664
Valve for steam cylinders, draining, T. D. Smith ... 546,907
Valve gear, Hill & Easley ... 546,925
Valve gear, engine, K. Moscicki ... 546,770
Vegetation, apparatus for exterminating, A. Scheibie ... 546,682
Velocipede, W. L. Decker ... 546,954
Vessel, arrowhead-shaped, M. Golinsky ... 546,921
Vise, lineman's, J. Ryan ... 546,903
Wagon and ambulance, convertible patrol, E. K. Hutchinson ... 546,855
Wagon jack, J. Campbell ... 546,652
Warp beams, adjustable head for, T. Blackburn ... 546,878
Water closets, means for flushing, W. H. Robinson ... 546,679
Water purifier, H. E. Gould ... 546,973
Water purifying apparatus, T. Craney ... 546,844
Water tube boiler, H. See ... 546,715
Water wheel, Haskins & Evans ... 546,663
Watering trough, automatic stock, W. Vosburgh ... 546,793
Welts and uppers, machine for trimming edges of, French & Meyer ... 546,851
Wheel. See Water wheel.
Wheels, wood rim for vehicle, C. A. Greenleaf ... 546,764
Windmill tower, T. Rogers ... 546,710
Window cleaning attachment, B. Fritsch ... 546,812
Windows, anti-rattler for, E. J. Donovan ... 546,657
Wire stretcher and carriage, combined, W. P. Dunlap ... 546,696
Wire tying machine, F. G. Chambers ... 546,727
Wrench. See Nut wrench. Ratchet wrench.

DESIGNS.

Bath tub, J. H. Gavin ... 24,709
Bedstead, O. E. A. Wiessner ... 24,711
Bottle, J. Proeger ... 24,695
Bowl for tea sets, C. C. Wientge ... 24,696
Broom ferrule, A. Walrath ... 24,705
Card mount, F. E. Hastings ... 24,693
Carpet, A. Bunel ... 24,719, 24,720
Carpet, N. S. Stewart ... 24,716 to 24,718
Coin receptacle, G. & W. Benze ... 24,694
Display stand, J. D. Goddard ... 24,702
Game board, T. H. B. Pierce ... 24,701
Glass vessel, H. T. Broden ... 24,697, 24,698
Handle tube, G. H. Dippo ... 24,704
Heater, Cullen & Grimes ... 24,712
Hinge, F. E. Ranney ... 24,707
Printed fabric, C. M. Porter ... 24,715
Ring, C. Knapp ... 24,690
Sash lock, A. A. Shields ... 24,706
Sewing machine frame, J. F. Hardy ... 24,710
Stove, H. G. Hagey ... 24,713
Toothpick, E. McChesney ... 24,691
Tops, flier for aerial, Cain & Skinner ... 24,692
Towel rack case, G. M. & W. A. Proctor ... 24,708
Trimming, F. Hassenpflug ... 24,714
Trunk corner iron, J. M. Schwerin ... 24,703
Type, font of printing, Rosenow & Schmohl ... 24,699
Type, font of printing, J. West ... 24,700
Watch dial, J. O. Jacot ... 24,689

TRADE MARKS.

Ale, Anheuser-Busch Brewing Association ... 27,088
Bibles, National Publishing Company ... 27,083
Canned goods, Sprague, Warner & Company ... 27,099
Cigars, tobacco, and certain named groceries, Alkire Grocer Company ... 27,087
Flour, wheat, Lambert & Smith ... 27,100
Furnaces and furnishings therefor, Brightman Furnace Company ... 27,103
Hardware, machines, and miscellaneous goods, Marshall-Wells Hardware Company ... 27,102
Knives, razors, scissors, and all kinds of cutlery and edge tools, Needham, Veall & Tyzack ... 27,101
Matches, Continental Match Company ... 27,086
Medicines, certain named, Mothers Salve Company ... 27,092
Mouth washes, and dentifrice, Oakley Soap and Perfumery Company ... 27,095
Ointments, pills, plasters, and specifics for all ailments, H. D. Brandreth ... 27,096
Pants, and men's vests, boys' woolen knee, I. Scheinman ... 27,084
Paste for removing spots and stains, A. Falk ... 27,089
Raspberries, J. T. Thompson ... 27,098
Refrigerants, chemical, Freezol Company ... 27,090
Remedies for blood, liver, stomach, skin, and lung diseases, W. S. Rice ... 27,091
Remedies for internal and external use, E. R. Reynolds ... 27,094
Remedy for alcoholism and nervous diseases, R. L. Van Devanter ... 27,093
Remedy for corns, J. D. Goddard ... 27,097
Shoes, leather, Gregory, Shaw & Company ... 27,085

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

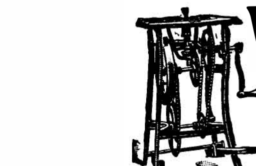
Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



WOOD or METAL WORKERS without steam power can save *time* and *money* by using our **Foot and Hand Power Machinery**

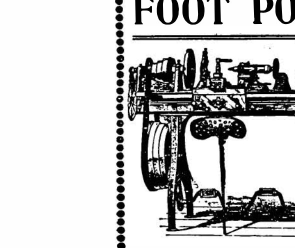
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers.

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

IDEAS DEVELOPED. Absolute secrecy. Send for particulars. Advice and suggestions free. Correspondence and sample orders solicited. 25 years in business. Gardam & Son, 98 John St., New York.

FOOT POWER LATHES



For Electrical and Experimental Work
Gunsmiths and Tool Makers
General Machine Shop Work
Bicycle Repair Work

High Grade Tools
Correct in Principle
Elegant in Design
Superior in Construction

THE BEST FOOT POWER LATHES MADE — CATALOGUE FREE

W. F. & JOHN BARNES CO.
1999 RUBY STREET, ROCKFORD, ILLS.

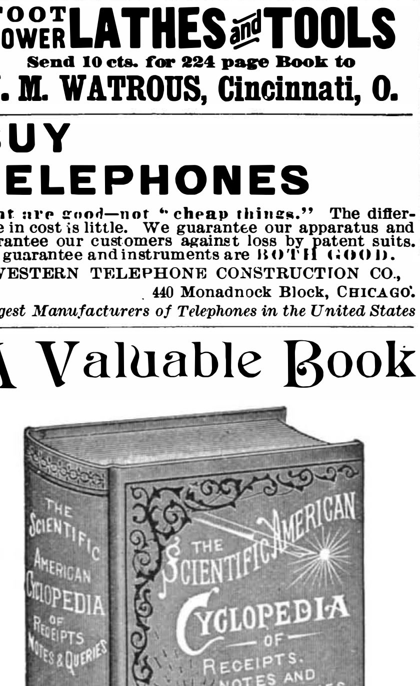
HARLEM RIVER IMPROVEMENT and Ship Canal.—An interesting account of the great government work recently completed in New York City. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1015.** Price 10 cents. To be had at this office and from all newsdealers.

FOOT POWER LATHES and TOOLS
Send 10 cts. for 224 page Book to
J. M. WATROUS, Cincinnati, O.

BUY TELEPHONES

That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are BOTH GOOD.
WESTERN TELEPHONE CONSTRUCTION CO.,
440 Monadnock Block, CHICAGO.
Largest Manufacturers of Telephones in the United States

A Valuable Book



12,500 Receipts. 708 Pages. Price $5.

Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

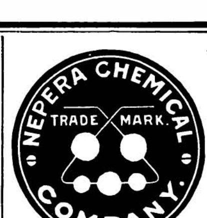
Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

☞ *Send for Descriptive Circular.*

MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE,
361 Broadway, New York.



VELOX PAPER

A Revolution in Photographic Printing.

GLOSSY or MATT. When exposed to the same light, prints **500 times quicker than albumen.** . . No dull or rainy weather to interfere with your work. **No dark rooms nor complicated manipulation.** Developed and toned *as fast as the printing frames can be filled. A choice of tones more beautiful than can be produced on any other paper.* Permanent prints. The greatest paper for hot or damp climates. **35 cents** in stamps brings two sample dozen cab's, developer and three sample prints. **Nepera** Platinoid, Enameled and Rough *Bromide Papers* are the best and most uniform in the market. **Nepera P O P,** an *insoluble* gelatine paper.

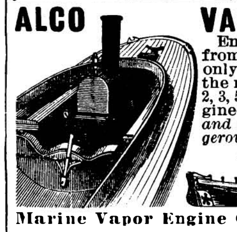
Nepera Chemical Co., Sole Manufacturers, **Nepera Park, N. Y.**

LIGHT AND ELECTRIFICATION.—BY Oliver J. Lodge. The fundamental facts of a new branch of physics, the subject of photo-electric action, the influence of illumination upon electrified surfaces. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1016.** Price 10 cents. To be had at this office and from all newsdealers.

VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
—10 SIZES.—
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

$18 buys a beautiful little Canoe; or a Magnificent Pleasure Boat for **$125**
☞ *Send for 60-page illus. catalog.*
J. H. RUSHTON, CANTON, N. Y.

ALCO VAPOR LAUNCH.



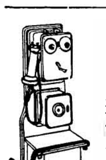
Engine and helm controlled from bow. Latest improved and only 12 to 1 motor now ready for the market. 18 to 40 ft. launches 2, 3, 5 and 7 h. p. No licensed engineer or pilot required. *Speed and safety guaranteed. No dangerous naphtha or gasoline used.*

Marine Vapor Engine Co., Jersey City, N. J.

THE RARER METALS AND THEIR Alloys.—A paper by Prof. Roberts-Austen, discussing certain phases in the life history of metals, with a view to showing the many excellent qualities that they possess. The structure and framework of metals as shown by the microscope. Allotropism. The rarer metals and how they may be isolated. Discriminating action exerted by metals. The electric furnace. The rare infusible metals and their future usefulness. Armor plate and irresistible projectiles. With 8 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1016** and **1017.** Price 10 cents each. To be had at this office and from all newsdealers.

SUPPLEMENT No. **1018** contains an article by the same author, on The Reduction of the Rarer Metals from their Oxides.

☞ 5178 ☜



TELEPHONE ARM RESTS

Sold in four weeks.

A successful invention. Highly recommended by Telephone Companies. Easily adjusted to any 'Phone. If you have a 'Phone, order an Arm Rest; solid brass, nickel plated. Only **$1.00** each: delivered on receipt of price, charges paid.
The American Telephone Arm Rest Co.
211 & 213 E. Randolph St., Chicago.
PATENTED. ☞ **AGENTS WANTED.**

NOVELTIES.—Dixie Novelty Co., Ltd., New Orleans, La., buy and sell Patented Novelties. Correspondence with manufacturers and dealers solicited.

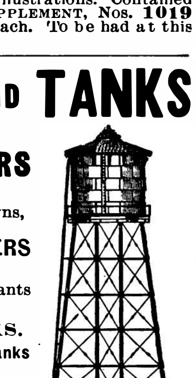
HELLO, CENTRAL!

Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best. We supply complete telephones or all or any of the parts to construct a telephone. Write for illustrated catalogue.
PHŒNIX INTERIOR TELEPHONE CO.,
131 Liberty St., New York.

THE SUBMERGED PIPE LINE ACROSS the Willamette River at Portland, Oregon.—By F. and A. S. Riffle. Description of a line of 28-inch cast iron submerged pipes forming portion of the main line constructed during 1893 and 1894, to supply the city of Portland with pure water from Bull Run, a mountain stream thirty miles distant. With 13 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1019** and **1020.** Price 10 cents each. To be had at this office and from all newsdealers.

TOWERS AND TANKS

PATENT SECTIONAL
ALL IRON TOWERS
of 4 and 12 Columns,
for Water Works, Cities, Towns, and Manufactories.
PLAIN, ALL WOOD TOWERS
ELEVATED TANKS
for Automatic Fire Sprinkler Plants
MANUFACTURERS OF
IRON and STEEL TANKS.
Louisiana Red Cypress Wood Tanks a Specialty.



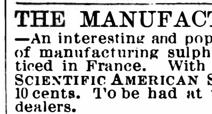
W. E. CALDWELL CO.,
219 E. Main Street,
LOUISVILLE, KY., U. S. A.

ARMSTRONG'S PIPE THREADING

—AND—
CUTTING-OFF MACHINES
Both Hand and Power.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools, Hinged Pipe Vises, Pipe Cutters. *Stocks and Dies universally acknowledged to be* THE BEST. ☞ *Send for catalog.*
Armstrong Mfg. Co.,
Bridgeport, Conn.

THE MANUFACTURE OF MATCHES. —An interesting and popular description of the method of manufacturing sulphur and safety matches as practiced in France. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1013.** Price 10 cents. To be had at this office and from all newsdealers.

STARRETT'S IMPROVED BEVELS

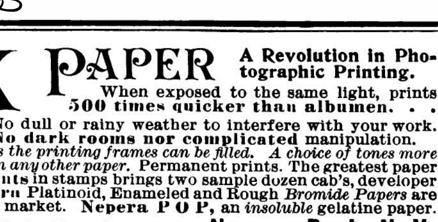


Illus'd Catalogue Free.

Blade and stock slotted through and through, thus admitting adjustments that cannot be obtained with a common bevel. Clamping screw head not shown Let into a rabbet flush with the surface of stock which will lie flat on work. Made in three sizes. 6 inch, $1.25, 9 inch, $1.50, 12 inch, $1.75.

The L. S. Starrett Co., Manufacturer of Fine Tools, P. O. Box 13, ATHOL, MASS.

HYPNOTISM My original method $2. 100 pp. pamphlet 10c. One on Personal Magnetism 10c. Dr. Anderson, S A 7, Masonic Temple, Chicago.

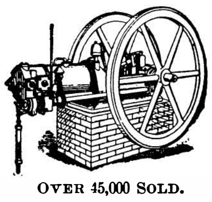


Engineers and Firemen Send 2c. stamp for 24 page pamphlet containing a list of questions asked by a board of examining engineers. Stromberg Pub. Co., St. Louis, Mo.

GASOLINE ENGINES.

1½ to 75 horse power. For Propelling Boats of all kinds. Cheapest Fuel, Absolute Safety, No Licensed Engineer, Simple Construction, Hundreds in Successful Use.
☞ *Write for illustrated catalogue.*
GLOBE GAS ENGINE CO.,
Merion Avenue & 49th Street. PHILADELPHIA, PA.

"OTTO"



GAS AND GASOLINE ENGINES.

⅙ to 100 h. p. Can be used in cities or in country independent of gas works or gas machines.

No Boiler, No Danger, No Engineer.

OVER 45,000 SOLD.

The Otto Gas Engine Wks., Incorp'd, **Philadelphia**

EDGE TOOLS

are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.
☞ *May we send you our Catalogue, which will give you some information?*
GRAFTON STONE COMPANY,
No. 80 River Street, GRAFTON, OHIO.

HAVE YOU SEEN
The New Green River A1 Drilling Machine?

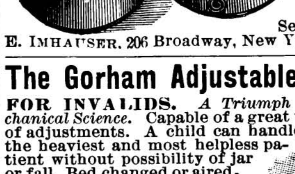
Everything done—drilling and reversing—with one hand without taking it from crank. Price - - **$15.00**
☞ *Send for Catalogue.*
WILEY & RUSSELL MFG. CO.
Greenfield, Mass., U. S. A.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our New Catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., *Publishers* SCIENTIFIC AMERICAN,
361 Broadway, New York.

Watchman's Improved Time Detector



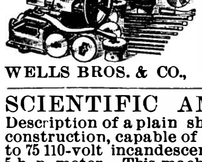
with 12 or 24 Keys, with Safety Lock attachment. Patented 1875-6-7. My inventions, and will sue all concerns selling or using the Safety Lock attachment, according to Decision of Circuit Court of U. S. for S. D. of N. Y. Send for circulars to
E. IMHAUSER, 206 Broadway, New York. P. O. Box 2875.

The Gorham Adjustable Bed

FOR INVALIDS. *A Triumph of Mechanical Science.* Capable of a great variety of adjustments. A child can handle the heaviest and most helpless patient without possibility of jar or fall. Bed changed or aired without removing patient. Tested in practice and highly recommended by doctors and surgeons. *Send for Catalog.*
F. F. WHEELER, Manuf'r,
30 Beaver St., Albany, N. Y.

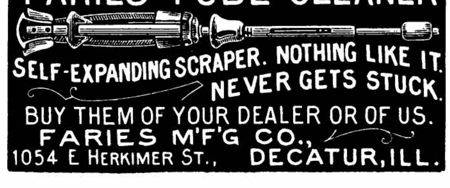
ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **59.** Price 10 cents. To be had at this office and from all newsdealers

LITTLE GIANT BOLT CUTTERS and NUT TAPPERS.



Complete with Tap Chuck, Taps, Dies, and Collets. Cutting 9 sizes, from ¼ to 1 inch. Has improved clutch on spindle for running die off after thread is cut, making quick return.
☞ *Send for fully illustrated catalogue.*
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-volt incandescent lamps, or of being used as a 5 h. p. motor. This machine was constructed especially for the benefit of the readers of the *Scientific American*, by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **865.** Price 10 cents. To be had at this office and from all newsdealers.

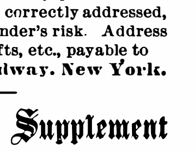


EMPIRE
• BOILER CLEANER •
COMPOUND

We Don't Offer Gratuities, but our Circular will give you the information that will enable you to **Save Time, Trouble and Money.** *Tried, approved, and being used by the Largest Railways and Factories in the East.*
OFFICE:
Kemble Bldg., 19 Whitehall St., N.Y.

THE CARBIDES AND ACETYLENE Commercially Considered.—By T. L. Willson and J. J. Suckert, Ph.D. A consideration of the carbides and acetylene from a commercial point of view, preceded by a brief history of these compounds, the methods of their formation, and their chemical and physical properties. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1015** and **1016.** Price 10 cents each. To be had at this office and from all newsdealers.

They All Like It.
The Ladies Like It.
So Do The Men.
Children Enjoy It.



Layman Pneumatic Boats.
☞ See SCI. AM., May 18, 1895.
Send 4c. in stamps for our handsomely illustrated catalogue.
Address H. D. LAYMAN,
30 West 29th St., cor. Broadway,
NEW YORK.

- - THE - -

SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.

Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **Three Dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to
MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,
MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to
MUNN & CO., 361 Broadway, New York.

Export Edition

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions —wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world.* $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.
MUNN & CO., Publishers.
361 Broadway, New York.